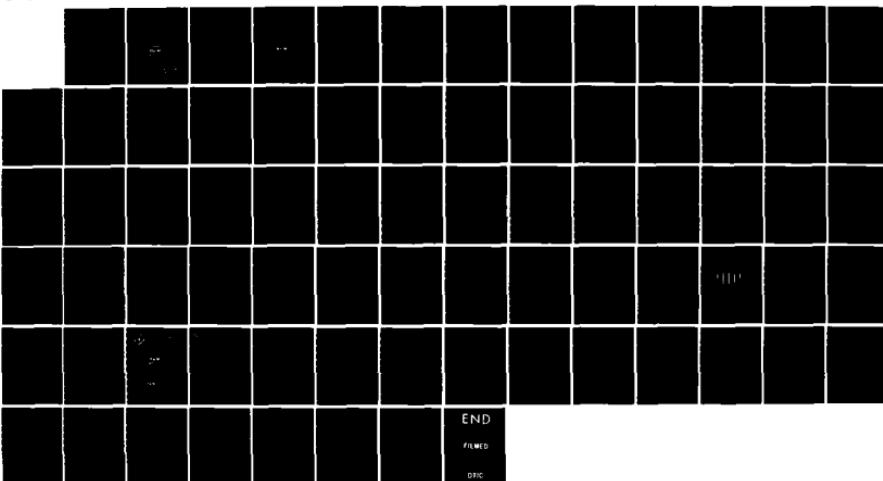
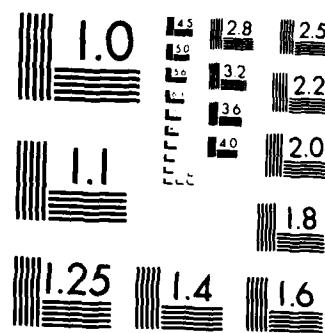


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USAF R&M ACTION PLAN DEVELOPMENT TEAM FINAL REPORT

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VOLUME I



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**USAF R&M ACTION PLAN
DEVELOPMENT TEAM
FINAL REPORT**

VOLUME I



1 FEBRUARY 1985



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PREFACE

The Air Force must improve the Reliability and Maintainability (R&M) of new and fielded weapon systems if we are to effectively meet the challenges of the coming decades. The growing threat has made operating bases and the systems, people, and support equipment located there increasingly vulnerable. Successful operations in this environment demands increased readiness, dependability, and mobility.

In addition, manpower availability will decrease over the coming decade making it more difficult to recruit and train the technical personnel needed to maintain increasingly complex weapons. Finally, current budget realities demand lower operations and support costs. Accelerated improvement of R&M can provide the leverage for the Air Force to improve military capability and live within these constraints.

The opportunity to improve R&M exists today. Technology is providing a margin that allows both capability and reliability improvements. Air Force leadership is committed to improved R&M and is providing clear direction and strong support. Contractors have demonstrated they have the design and manufacturing capabilities needed to bring this opportunity into reality. R&M 2000, the Air Force R&M Action Plan, is designed to take advantage of these opportunities and provide the Air Force with a clear roadmap to institutionalize the commitment to accelerated improvement of R&M.

R&M 2000 focuses on the management process necessary to accelerate R&M improvement rather than on specific technical R&M issues. It aims at changing the way the Air Force thinks about and manages R&M with the conviction that technical innovation will flourish in an organizational environment receptive to accelerated R&M improvement. To successfully institutionalize this commitment, the Air Force must sustain top management support, focus resources on effective R&M, and convince both Air Force and contractor organizations of the seriousness of this effort.

In summary, the Air Force must demand, support, and reward accelerated R&M improvement. It was to achieve these objectives that R&M 2000 was written.


KENNETH V. MEYER, Colonel, USAF
Team Chief
R&M Action Plan Development Team

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SECTION I: EXECUTIVE SUMMARY

The Secretary and Chief of Staff of the Air Force, in a memorandum to all Major Commands and Separate Operating Agency commanders dated 17 September 1984 (Appendix 1), renewed the Air Force commitment to Reliability and Maintainability (R&M) and committed the Air Force to demanding accelerated improvements in R&M in both new and fielded weapon systems. They also directed in that memorandum that AF/RD and AF/LE form a working group of logisticians, operators, and acquisition specialists to develop recommendations that would institutionalize this Air Force commitment to improved Reliability and Maintainability. The Secretary and Chief believe this renewed emphasis on R&M is needed now in order for the Air Force to attain higher levels of combat capability in the face of an intensifying threat and increasingly constrained manpower and fiscal resources. In the past, R&M considerations have been secondary to other cost, schedule, and performance factors; consequently, the R&M characteristics of many fielded weapon systems have not always met logistical expectations. There is now an opportunity for substantial R&M improvement which, if pursued, can lead to enhanced combat capability and lower operations and support costs.

This report, published in two volumes, documents the major activities of the R&M Action Plan Development Team with an emphasis on the methodology, findings, and recommendations. Volume I outlines the team's tasking and approach and describes the findings, conclusions, and recommendations that led to the development and approval of the Air Force R&M Action Plan, R&M 2000 (Appendix 2). Volume II is a compilation of key background documents that describe in more detail the establishment of the team and the development of its recommendations.

The R&M Working Group charter, approved by AF/RD and AF/LE on 9 November 1984, established a General Officer Steering Group and an R&M Action Plan Development Team that collectively formed the R&M Working Group. The General Officer Steering Group was cochaired by Lieutenant General Robert D. Russ, AF/RD, and Lieutenant General Leo Marquez, AF/LE. The R&M Action Plan Development Team, drawn from resources within the Air Staff, Air Force Systems Command, Air Force Logistics Command, and other key organizations, worked under the guidance of the General Officer Steering Group. The team was tasked to review the current state of R&M in the Air Force and develop an Air Force action plan designed to institutionalize leadership's commitment to accelerated improvement of R&M, thereby increasing combat efficiency and operational supportability.

The Action Plan Development Team completed a three-phased project culminating in the approval of the Air Force R&M Action Plan, R&M 2000. Phase I was a background and data gathering effort, which focused on key data sources such as R&M literature, policies and procedures, organizations and key personnel, and industry views. Phase II included a review of selected weapon system programs to confirm and cross-check the findings and concerns that surfaced in Phase I. Additionally,

during Phase II, the team reviewed major R&M issues such as organization, people, data, and planning, and performed an analysis of the Phase I findings in relation to the total weapon system acquisition cycle. Phase III consisted of the final development, coordination, and approval of the R&M Action Plan.

The data gathering efforts of Phases I and II produced few revelations. The R&M problems and perceptions, for the most part, were long-standing, well documented, and prevalent throughout all sources of information. As expected, high on the list of impediments to R&M were the pressures on program management to meet cost, schedule, and performance parameters and the relatively low priority afforded R&M. There was also a general lack of accountability noted across the Air Force and an inability to precisely define, track, measure, or cost R&M. Organizational focus was very limited, and actions with industry on R&M have often been inconsistent with stated intentions. Essential R&M building blocks noted in successful programs included strong commitment at the top, clear communication of objectives, technical competence, clear authority and accountability, effective planning, and a strong review process.

R&M 2000 was written to sustain top management commitment to R&M, focus Air Force resources on effective R&M, and convince Air Force and contractor organizations of the seriousness of this effort. To accomplish this, R&M 2000 emphasizes the six management objectives listed in Figure I-1.

- **PROVIDE CLEAR DIRECTION THROUGH VISIBLE R&M GOALS AND POLICY TO INCREASE COMBAT EFFECTIVENESS**
- **ESTABLISH ORGANIZATIONAL FOCUS AND EXPAND TRAINING TO BUILD R&M TECHNICAL EXPERTISE, ADVOCACY, AUTHORITY, AND ACCOUNTABILITY**
- **IMPROVE R&M PLANNING TO CONSOLIDATE EFFORTS, TIE R&M TO OPERATIONAL GOALS, AND COORDINATE ACROSS COMMANDS**
- **ENSURE EFFECTIVE ACCOUNTABILITY AND FEEDBACK TO MEASURE PROGRESS IN THE R&M IMPROVEMENT PROGRAM**
- **PROVIDE POSITIVE COMMUNICATION AND MOTIVATION TO SUSTAIN COMMITMENT TO AND SUPPORT FOR R&M IMPROVEMENT**
- **OBTAIN INDUSTRY COMMITMENT TO ENSURE THAT CONTRACTORS HAVE THE MOTIVATION AND CAPABILITY TO SUPPORT R&M REQUIREMENTS**

Figure I-1: R&M 2000 Objectives

These objectives focus on the management process rather than on specific technical R&M initiatives. They are intended to change the way the Air Force manages R&M by directly impacting the key management systems such as the planning, reward, and budget systems, and to positively influence the formal and informal channels of communication that flow between the Air Force and industry. In this way, the Air Force intends to create an organizational environment that will foster R&M improvement and will allow R&M technical innovation to flourish.

The first major objective is to establish clear direction for R&M improvement through visible goals and policy to increase combat effectiveness and operational supportability. R&M status and initiatives at each command and on each weapon system will be linked directly to operational factors such as readiness, dependability, mobility, cost, and manpower. Management indicators will be used to report R&M status to management, communicate R&M progress, and highlight the relationships of improved R&M to improved combat capability. Finally, Air Force doctrine and policy will be upgraded to reflect the renewed commitment to improved R&M.

Second, the Air Force must establish an organizational infrastructure to implement the essential elements of the R&M improvement program, to form a base of technical expertise, and to build advocacy, authority, and accountability into the R&M program. The team recommended the establishment of an Air Staff Special Assistant for R&M to be the Air Force R&M focal point and lead the implementation of R&M 2000. A charter for the Special Assistant for R&M was written and approved (Volume II, Annex I). Major commands will in turn also review their R&M organizational structure to ensure they can institutionalize R&M in their commands and meet the demands of R&M 2000. R&M training, education, and career development programs will also be enhanced.

Third, the Air Force must establish an R&M planning system that will consolidate R&M efforts, tie R&M to operational goals, and ensure coordination across commands, systems, and technologies. Four types of planning are envisioned. Major commands will develop command-level R&M plans, which will outline the command's current R&M goals, initiatives, and problem areas. Weapon system R&M plans will be maintained by Air Force Systems Command and Air Force Logistics Command to describe each systems R&M parameters, requirements, present status, and initiatives. Annual R&M technology plans by Air Force Systems Command and Air Force Logistics Command will identify key initiatives to ensure that new technologies are exploited and user needs are adequately addressed. Annual weapon system modification and preferred spares planning by Air Force Logistics Command will prioritize these efforts and tie their potential benefits to operational goals.

The fourth objective is to establish a system to ensure accountability, review, and feedback on the direction and progress of the R&M program. This objective is designed to ensure the Action Plan is effectively implemented and supported. It includes reviews of major

programs, validation of operational needs, improved data collection and tracking, staff assistance, and Inspector General surveillance.

The fifth objective is to establish a communication and motivation program to sustain the commitment to and organizational support for the R&M improvement effort. Successful R&M programs will be identified and promoted as models and standards of excellence, a coordinated media effort will communicate senior-level commitment, and symposia and workshop programs will promote a cross-fertilization of ideas and initiatives.

The sixth and final objective is to establish industry commitment to R&M to ensure contractors have the motivation and technical capability to support Air Force R&M requirements. The key instruments for developing a commitment in industry to improved R&M are the solicitations and contract documents. These documents must clearly communicate and reinforce the Air Force demands for improved R&M. Raising the consideration of R&M in source selections; the enhanced use of product warranties, performance agreements, and incentives in contracts; and increased R&M emphasis in design reviews will ensure contractor commitment and motivation.

Further details on these major objectives as well as discussion of the R&M Action Plan Development Team effort are contained in this volume. Section II amplifies the R&M Working Group's tasking and approach to the development of the Action Plan. Section III discusses the team's findings on the state of R&M in the Air Force. Section IV discusses the team's conclusions and Action Plan recommendations. Finally, Section V provides a summary of the Air Force R&M Action Plan, R&M 2000.

SECTION II: R&M WORKING GROUP

The R&M Working Group was established to implement the SECAF and CSAF action memorandum of 17 September 1984, with the objectives of communicating the corporate Air Force commitment to R&M and developing an Air Force action plan for institutionalizing this commitment. The charter of this working group provided for a General Officer Steering Group cochaired by AF/RD and AF/LE, to function as the corporate body to direct the activities of the R&M Action Plan Development Team. This team, consisting of Air Staff action officers and representatives from Air Force Systems Command, Air Force Logistics Command, and other key organizations, was tasked to review Air Force R&M across functions, programs, and commands and write the Air Force R&M action plan. In this section, the formulation, methodology, and outputs of this R&M Action Plan Development Team are discussed.

A. Tasking. The R&M Working Group charter (Volume II, Annex A) called for the R&M Action Plan Development Team to accomplish a review of Air Force R&M activity by conducting a literature review of pertinent internal and external documents; examining existing Air Force and Department of Defense policies, procedures, and regulations; surveying key organizations and personnel; and interviewing industry management. With this background, the team then surveyed 13 weapon system programs within the Department of Defense to confirm tentative recommendations and validate the final action plan. Additionally, the team conducted detailed analysis of a number of issues and concerns germane to the action plan, such as Air Staff organization, personnel and training, requirements process, data systems, funding, planning, and industry relationships.

B. Working Group Composition. The General Officer Steering Group was cochaired by Lieutenant General Robert D. Russ (AF/RD) and Lieutenant General Leo Marquez (AF/LE). Lieutenant General David L. Nichols (AF/XO) subsequently joined the Steering Group as a signatory to the R&M action plan. The R&M Action Plan Development Team was headed by Colonel Kenneth V. Meyer (AF/RDC) and staffed on an ad hoc basis by representatives from the organizations shown in Figure II-1 (see Volume II, Annex B for Team Roster).

C. R&M Action Plan Development Team Approach. The Team approach was to complete the background work necessary to establish team credibility; to contact as many Air Force and contractor organizations as possible, solicit their ideas, and sensitize them to the increased R&M emphasis; and to prepare specific recommendations that would institutionalize the Air Force R&M commitment. This effort was divided into three phases as shown in Figure II-2.

with the publicity from the recent aircraft engine competition, the strong Air Force supportability thrust in Independent Research and Development (IR&D), and the upcoming Advanced Tactical Fighter source selection, had clearly gained the attention of senior aerospace managers. Other areas of concern expressed were the limited availability of design engineers with practical R&M experience and the need to obtain increased exposure to operational environments in light of a growing awareness that laboratory and manufacturing environments differ significantly from what the user experiences.

In summary, the industry input was comprehensive, enthusiastic, and concerned. Many aerospace firms had put together impressive and effective R&M programs. But they were clearly waiting to see how real this Air Force R&M initiative really was and were looking to statements of work, requests for proposal, and source selections to confirm the seriousness of the Air Force intent.

E. Programs. The programs team visited 13 program offices in the Air Force, Army, and Navy as previously shown in Figure II-4. They also discussed R&M issues with staff agencies that supported these and other programs. Over 90 key personnel in these various organizations and programs were interviewed.

The program managers were continually confronted with competing resource demands from many functional areas. They generally agreed that a clear indication by senior management of the priority to be afforded R&M was needed and that management must be ready to back this commitment with resource support. R&M commitment must be evident in tradeoff funding decisions at all review levels. It should also be reflected in clear, realistic statements of requirements at program initiation.

An increased emphasis on R&M would require more involvement by the using command during the definition and production phases and the willingness of management to provide the time and dollars to run an effective R&M program. Program managers agreed that more regulations and policies were not required, but rather that consolidation and prioritization of existing policies and procedures should be undertaken. There was also considerable program manager concern about the possible loss of program flexibility and authority that another strong "ility" thrust might bring.

The interviewees were in accord on the need for an R&M advocate, but held reservations about any additional R&M reporting, tracking, or independent reviews. Increased R&M emphasis in program reviews should be accomplished by emphasizing existing requirements and policies. Preserving program management flexibility was a consistent concern among those interviewed. Another concern was the tendency for concentration of R&M talent at the higher headquarters. Improvement in field-level staffing should occur prior to headquarters staffing, and headquarters organizations should be oriented toward assistance rather than over-

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Figure III-6: Industry Interviews

<ul style="list-style-type: none"> ● SCOPE <ul style="list-style-type: none"> — CONTACTED OVER 25 AEROSPACE FIRMS — PRIMES, MAJOR SUBS, AND ASSOCIATIONS
<ul style="list-style-type: none"> ● FINDINGS <ul style="list-style-type: none"> — KNOW HOW TO DO R&M — WAITING TO SEE IF R&M COMMITMENT IS REAL — LOOKING FOR EMPHASIS IN RFP AND CONTRACT

Figure III-7: Industry Review

Despite the number of organizations that participated in the development, management, and advocacy of R&M, there was no centralized control and direction. For example, there was not sufficient focus at the Air Staff level either to oversee the total R&M program or to advise senior leadership on weapon system successes or shortcomings. The perception in the field was that R&M had a low priority. Frequently, personnel worked R&M issues on a part-time basis and were often unable to make meaningful contributions due to more pressing tasks. In the funding process, specific R&M programs did not fare well due to tradeoffs similar to those made during weapon system development. The lack of a corporate ability to adequately define and measure specific R&M costs and benefits contributed to this lack of funding support during the competitive budgetary process.

Finally, people assigned to R&M tasks often lacked the education and training necessary to identify and carry out an effective R&M program. The absence of a defined R&M career path, little formal training, and perceptions of a "dead-end career" had resulted in many organizations being unable to obtain and keep high-quality, experienced people.

D. Industry. The industry team contacted and interviewed executives from over 25 aerospace firms, including the prime contractors, major subcontractors, and several industry associations depicted in Figure III-6. The industry team's key findings are shown in Figure III-7 and discussed below.

Industry capability to design and manufacture highly reliable and maintainable systems was available and had been demonstrated on space programs, missile guidance systems, aircraft structures, and engines. The critical R&M techniques, such as an iterative design process, realistic testing, stringent parts control, and disciplined feedback systems, were known and had been used. However, other programmatic pressures had often caused underfunding, delays in application, or in some cases, cancellation of important R&M tasks.

Although industry welcomed renewed Air Force commitment to R&M, they remained skeptical about whether it would be an enduring commitment. They looked to their contracts to reflect the commitment and convey the incentive for them to design and manufacture systems with improved R&M characteristics. They strongly indicated that source selection criteria and contractual rewards must reflect the emphasis on R&M if it is to compete successfully with performance requirements and other programmatic constraints.

Several corporations provided examples of recent corporate policies that strongly supported increased R&M efforts. However, it was stressed time and time again that R&M incentives are of little value unless they are on par with performance incentives. The 17 September 1984 SECAF and CSAF memo, sent to key industry leaders on 3 December 1984 (Volume II, Annex D), had generated considerable interest. This, combined

shown in Figure III-5, both the Army and Navy have a more focused approach to R&M. In fact, one of the consistent criticisms of the Air Force R&M program was the lack of R&M organizational advocacy. The Air Force was not organized to effectively influence and improve R&M. The ability of R&M people or organizations to impact program events was very limited and diffused. Lacking authority and relegated to a low priority, R&M specialists assumed an advocacy role with little more than their own persuasive abilities for leverage.

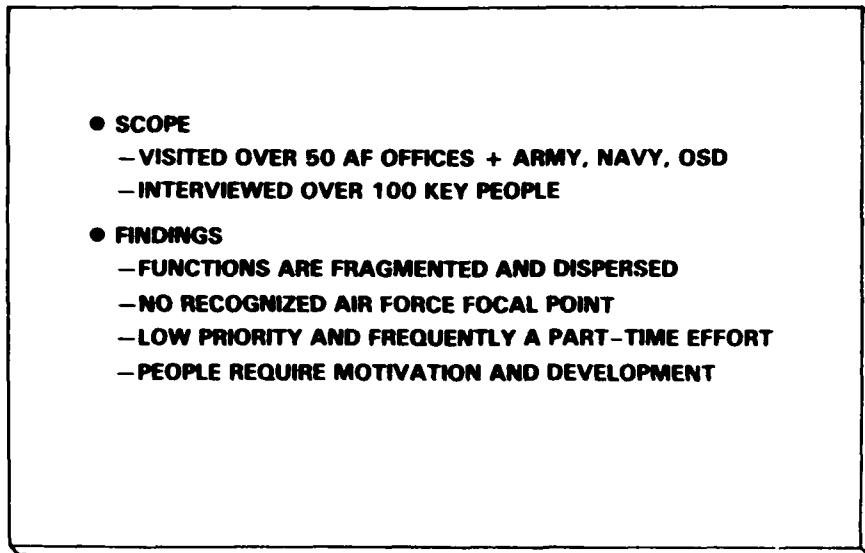


Figure III-4: R&M Organization Review

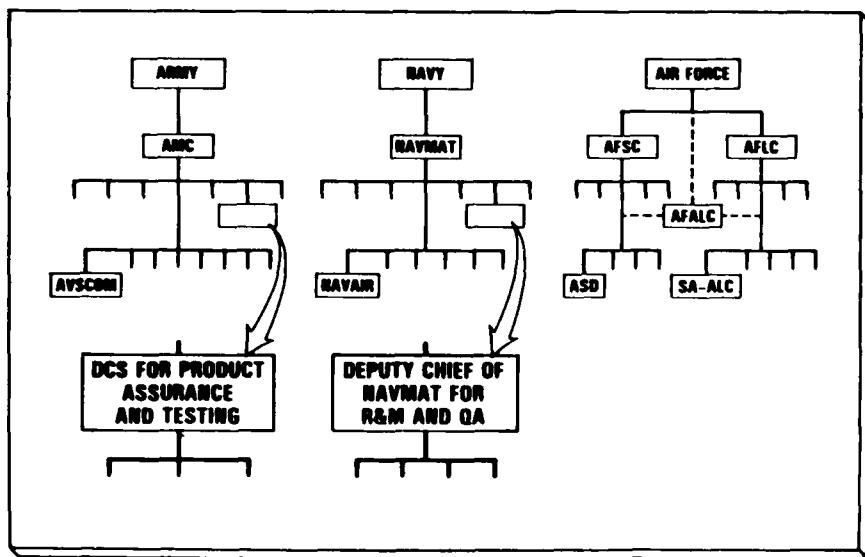


Figure III-5: Organizational Comparison

R&M audit trail was not clear, and several related functional regulations failed to address R&M as a critical management consideration.

However, it was not a lack of policy or procedural guidance that impeded R&M improvement. Ineffective implementation of current R&M guidance and the low priority assigned to many R&M tasks outlined in existing regulations was a problem. There was often a lack of focus in the R&M program because of overlapping, conflicting, and diffuse responsibilities. Improvement in the Air Force R&M program will require some regulatory revision and consolidation to provide clear lines of authority, establish accountability, and create an appropriate organizational infrastructure. In general, however, the policy and procedures review found the regulatory basis for an excellent R&M program. To gain the benefits of that program, more discipline in implementing existing policy was required as indicated in Figure III-3.

- **SCOPE**
 - REVIEWED 170 DOD/SERVICE DOCUMENTS
 - COVERED ALL FUNCTIONAL AREAS
- **FINDINGS**
 - PLENTY OF POLICY AND PROCEDURES
 - SOME DISCONNECTS EXIST
 - SOME REEMPHASIS IS REQUIRED
 - MORE POLICY IS NOT THE ANSWER
 - POLICY CONSOLIDATION AND FOCUS
 - IMPLEMENTATION DISCIPLINE

Figure III-3: Policy and Procedures Review

C. Organization and Key Personnel. The organization and key personnel team visited over 50 Air Force offices as well as those of the Army, Navy, and the Office of the Secretary of Defense. They interviewed over 100 people on R&M matters and held many more informal discussions. Their key findings are summarized in Figure III-4 and discussed below.

The team studied the differences among the Service acquisition organizations and their differing approaches to R&M management. As

- AFR 55-15: UNIT COMBAT READINESS REPORTING
 - REFINED READINESS CRITERIA BASED ON R&M
- AFR 57-4: MODIFICATION PROGRAM APPROVAL AND MANAGEMENT
 - DEVELOP A MODIFICATION PRIORITIZATION PROCESS BASED ON R&M CONTRIBUTION TO MISSION CAPABILITY
- AFR 66-110: AEROSPACE VEHICLE AND EQUIPMENT INVENTORY, STATUS, AND UTILIZATION REPORTING SYSTEM (AVIUS)
 - INCORPORATE THE DATA REQUIRED BY THIS REGULATION INTO THE R&M MANAGEMENT INFORMATION SYSTEM (MIS) SOON TO BE DESCRIBED IN AFR 800-18
- AFR 66-1: MAINTENANCE MANAGEMENT POLICY
 - IMPLEMENT RELIABILITY-CENTERED MAINTENANCE POLICY
- AFR 66-6: APPLICATION AND USE OF ELAPSED TIME INDICATORS AND EVENT COUNTERS
 - INCORPORATE THE DATA REQUIRED BY THIS REGULATION INTO THE R&M MANAGEMENT INFORMATION SYSTEM (MIS) SOON TO BE DESCRIBED IN AFR 800-18
- AFR 66-14: EQUIPMENT MAINTENANCE POLICIES, OBJECTIVES, AND RESPONSIBILITIES
 - IMPLEMENT RELIABILITY-CENTERED MAINTENANCE POLICY
- AFR 66-30: PRODUCT IMPROVEMENT POLICY (PIP) FOR OPERATIONAL EQUIPMENT
 - INCORPORATE THE DATA REQUIRED BY THIS REGULATION INTO THE R&M MANAGEMENT INFORMATION SYSTEM (MIS) SOON TO BE DESCRIBED IN AFR 800-18
- AFR 70-15: SOURCE SELECTION POLICY AND PROCEDURES
 - MAKE R&M COEQUAL WITH COST, SCHEDULE, AND PERFORMANCE IN SOURCE SELECTION
- AFR 80-14: TEST AND EVALUATION
 - EMPHASIZE R&M TESTING THROUGHOUT THE WEAPON SYSTEM LIFE CYCLE
- AFR 300-15: AUTOMATED DATA SYSTEM PROJECT MANAGEMENT
 - INCLUDE R&M CONSIDERATIONS IN COMPUTER HARDWARE/SOFTWARE ACQUISITION AND MANAGEMENT
- AFR 400-51: OPERATIONS OF THE LOGISTICS RESEARCH PROGRAM
 - INCLUDE R&M AS AN OBJECTIVE IN LOGISTICS RESEARCH
- AFR 400-84: LOGISTICS SUPPORT PLANS FOR GROUND C-E SYSTEMS AND EQUIPMENT
 - INCLUDE R&M IN GROUND C-E LOGISTICS SUPPORT PLAN
- AFR 800-2: ACQUISITION PROGRAM MANAGEMENT
 - MAKE R&M COEQUAL WITH COST, SCHEDULE, AND PERFORMANCE IN ACQUISITION MANAGEMENT
- AFR 800-8: INTEGRATED LOGISTICS SUPPORT PROGRAM
 - UPDATE WITH EMPHASIS ON R&M
- AFR 800-13: AIR FORCE FEEDBACK POLICY
 - INCORPORATE THE DATA REQUIRED BY THIS REGULATION INTO THE R&M MANAGEMENT INFORMATION SYSTEM (MIS) SOON TO BE DESCRIBED IN AFR 800-18
- AFR 800-18: AIR FORCE RELIABILITY AND MAINTAINABILITY PROGRAM
 - REWRITE TO IMPLEMENT DODD 5000.40
- AFR 800-22: CFE VERSUS GFE SELECTION PROCESS
 - INCLUDE R&M AS A CONSIDERATION IN CFE/GFE TRADEOFF DECISIONS

Figure III-2: Proposed Policy Changes Needed

these data, the Air Force can address spares decisions, level-of-repair issues, and preventive maintenance questions. In addition to these decision-making examples, there is the matter of monitoring systems to detect deterioration of R&M due to changes in operating environment, mission, management emphasis, or reporting discipline. Item modification may be required as a result of such deterioration.

The literature review provided key insights into the scope and complexity of R&M managerial and technology issues. It provided useful source information throughout the effort and resulted in the establishment of a substantial R&M library. This library was provided to the Special Assistant for R&M upon completion of the team's effort.

B. Policy and Procedures. The policy and procedures team reviewed over 170 Department of Defense, Service, and command-level policy documents, a sample of which is shown in Figure III-1.

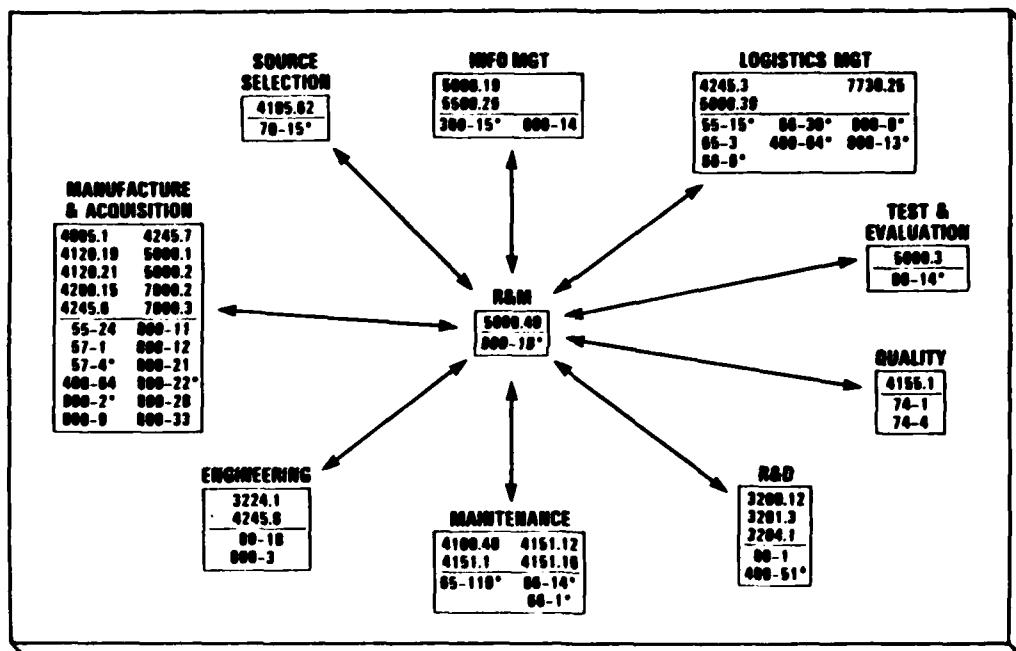


Figure III-1: R&M Regulatory Overview

The team found that the policy and procedures adequately covered R&M and provided a good basis for the injection of R&M into the acquisition process. The primary Air Force implementing directive, AFR 800-18, Air Force Reliability and Maintainability Program, contained most of the essential R&M program elements. Some R&M policy shortfalls were noted by the team and are summarized in Figure III-2. For example, Department of Defense R&M objectives were not clearly flowed down, the weapon system

Impediments to improved R&M are, in large part, resolvable with increased management emphasis. The absence of timely and sufficient management attention has been cited as the primary impediment to increased R&M achievement. For example, in the drive to reduce acquisition time, R&M tradeoffs for cost, schedule, and performance improvements have occurred. Most affected by shortened acquisition cycles are R&M testing and validation. Life cycle cost analysis should provide information for such tradeoff decisions, but many life cycle cost models do not effectively measure R&M factors. Management emphasis on increased competition can also impact R&M as procurements potentially shift from vendors with known high reliability to others with unproven records. Aside from these managerial issues, there are various external factors such as rapidly changing technology and diminishing procurement quantities that can also hinder R&M improvement.

Many existing R&M managerial and technology initiatives are documented in the literature. These include programs such as Reliability-Centered Maintenance (RCM), Increased Reliability of Operational Systems/Logistics Investment Screening Technique (IROS/ LIST), Combined Environmental Reliability Testing (CERT), and various Joint Logistics Commanders' initiatives. Technology initiatives include computer graphic design and maintenance techniques, Very High Speed Integrated Circuits (VHSIC), composites and other high-technology materials, fiber optics, and inspection techniques such as the Spectrometric Oil Analysis Program (SOAP).

There are many parameters used to assess R&M. For example, the Institute for Defense Analyses R&M Study documents the strengths and weaknesses of 8 readiness, 17 reliability, 7 maintainability, and 2 manpower parameters commonly used within the Department of Defense. The choice of parameters is often a function of the decision environment and the ease of data collection. Data collection difficulties are often resolved with factor proxies such as "K factors," used to adjust flying hours to more nearly represent operating hours when estimating component Mean Time Between Failure. Further, some methods of analyzing failure data are inappropriate during stages of a component's lifetime when the failure rate is not constant. For items with a constant failure rate, there are several data bases that provide useful reliability estimates. As an example, the Maintenance Data Collection (MDC) system tracks field Mean Time Between Failure at the component level. Rome Air Development Center's Optimized Reliability and Component Life Estimator (ORACLE) system provides automated data retrieval capability on certain reliability data. Air Force Systems Command's System Effectiveness Data System (SEDS) contains some failure data useful in design assessment. There is considerable support for a unified system that would provide failure data using parameters meaningful throughout a weapon system's life cycle.

Data collection supports a variety of decision-making processes. Not only do design engineers need R&M data to evaluate their designs and measure reliability growth, but the Air Force needs these data to verify that contractual requirements have been satisfied. Also, with

SECTION III: DISCUSSION OF FINDINGS

During Phases I and II of this project, the R&M Action Plan Development Team surveyed five major sources of information to determine the status of R&M within the Air Force. This effort was designed to ensure a credible basis was established for recommendations and to support action plan objectives with empirical evidence. This section summarizes the major observations of the five subteams, which considered literature, policy and procedures, organization and key personnel, industry, and programs and discusses the key R&M building blocks, impediments, and initiatives noted by the team. Each subteam documented the results of its research and interviews on data sheets based on ten key questions identified in Figure II-3. This information was then compiled into individual team reports, which provided the basis for the in-depth analysis completed during Phases II and III. Volume II, Annex E provides an example of a raw data sheet and the report from the literature subteam.

A. Literature Review. The R&M literature was found to be both comprehensive and diverse. For example, surveys of academic R&M research have counted over 1,000 contributions during the past several decades. A study by the Institute for Defense Analyses (IDA) lists over 850 documents from the Department of Defense, the Services, and civilian sources. Using bibliographies from the Defense Logistics Studies Information Exchange and the Defense Technical Information Center, as well as personal references from team members, the literature review subteam identified over 130 key articles, papers, and studies of immediate value to the team effort. Each document was abstracted with the ten key questions in mind. The major observations found in this literature are discussed below.

The "meaning" or "definition" of R&M depends on one's perspective. Design engineers tend to view R&M as a deterministic, measurable characteristic of design that is usually stated in terms such as Mean Time Between Failure (MTBF) and Mean Time To Repair (MTTR). Statisticians consider R&M as a stochastic characteristic measuring the uncertainty of lifetime (described by probability distributions). Management, on the other hand, looks at R&M in operational terms such as readiness, durability, and logistics support implications.

There are several essential elements to an effective R&M program. They begin with top-level management commitment. Without senior-level commitment, R&M tends to be traded away in the acquisition competition with cost, schedule, and other performance requirements. Another critical factor is R&M emphasis during the design process. Computer-aided design and manufacturing technology will significantly impact this area in coming years. Finally, to properly monitor R&M progress, an effective data tracking system is required to provide appropriate failure, maintenance workload, and cost data throughout the life cycle of our weapon systems.

The final product, this report, was written to document the team's effort and provide insight into the team organization, methodology, and recommendations. This report is in two volumes. The first summarizes the team's findings and conclusions. The second volume is a compilation of key background documents that describe in more detail the establishment of the team and the development of its recommendations.

D. R&M Working Group Products. There were five products prepared by the Action Plan Development Team under the guidance of the General Officer Steering Group. First, an interim briefing was prepared and presented to the Air Staff Board and the Air Force Council on 19 December 1984. This briefing, contained in Volume II, Annex F, reported the results of the team's first phase and outlined critical R&M building blocks, impediments, initiatives, and areas seen as potential Phase II recommendations.

Second, the final briefing was prepared and presented to the senior Air Force leadership as shown in Figure II-5. This briefing outlined the scope and rationale for the Action Plan recommendations and requested approval for R&M 2000. A copy of this briefing is included in Volume II, Annex G.

WHO	WHEN
AFALC/CC	7 JANUARY 1985
AFLC	8 JANUARY 1985
AF/RD/LE/XO	9 JANUARY 1985
AFSC/CC	14 JANUARY 1985
AIR STAFF BOARD	15 JANUARY 1985
AIR FORCE COUNCIL	18 JANUARY 1985
SAF/AL	22 JANUARY 1985
SAF/OS AND AF/CC	23 JANUARY 1985

Figure II-5: Final Briefing Schedule

The third and most important product was the USAF R&M Action Plan, R&M 2000. It was written by the team during Phase III and approved by SECAF and CSAF on 1 February 1985 to serve as the Air Force charter for accelerated R&M improvement (Appendix 2).

Fourth, the R&M 2000 Implementation Plan was written by the team for the new R&M Air Staff organization and the major commands to use as a guide to initiate the implementation of the R&M 2000 actions. A copy of this plan is in Volume II, Annex H.

Finally, the industry team interviewed over 25 aerospace firms, including prime contractors, subcontractors, and several industry associations. The aerospace firms that were contacted are shown in Figure III-6.

During Phase II of the effort, two major activities were undertaken. The program subteam visited selected Air Force weapon system program offices from across the Air Force, as well as one Navy and one Army program as shown in Figure II-4. They used the same methodology, documentation, and reporting procedures employed by the Phase I teams. A summary of their findings is included in Section III of this volume.

PROGRAM	ORGANIZATION
F-111	SACRAMENTO AIR LOGISTICS CENTER
A-10	SACRAMENTO AIR LOGISTICS CENTER
ATF	AERONAUTICAL SYSTEMS DIVISION
ENGINES	AERONAUTICAL SYSTEMS DIVISION
C-17	AERONAUTICAL SYSTEMS DIVISION
F-16	AERONAUTICAL SYSTEMS DIVISION
AMRAAM	ARMAMENT DIVISION
GPS	SPACE DIVISION
PAVE PILLAR	AIR FORCE WRIGHT AERONAUTICAL LAB (AFWAL)
JAFE	AIR FORCE WRIGHT AERONAUTICAL LAB (AFWAL)
MUNITIONS	AIR FORCE ARMAMENT LAB (AFATL)
F-18	NAVY
HH-60	ARMY

Figure II-4: Programs Visited

The second major effort in Phase II was an in-depth review of specific R&M issues documented during Phase I. The team was divided into issue subteams that focused on key areas such as R&M organization, data systems, requirements process, R&M planning, quality in manufacturing and design, personnel and training, budgets, contractor motivation and commitment, and the leverage points for R&M in the acquisition cycle. The results of the issue subteams, which in many cases led directly to the Action Plan recommendations, are summarized in Section IV.

Phase I consisted of four major reviews in the areas of literature, policy and procedures, organization and key personnel, and industry. Section III of this volume discusses the findings of these subteams. Each of the four subteams focused on ten key questions, which represented the research goals of Phase I and were used to standardize the multiple inputs. These key questions are listed in Figure II-3.

- **DEFINITION: WHAT IS R&M?**
- **BUILDING BLOCKS: WHAT ARE ESSENTIAL ELEMENTS OF R&M?**
- **DATA BASE: HOW DO WE MEASURE R&M?**
- **PEOPLE: WHO IS DOING R&M?**
- **PROGRAM DATA: HOW WELL ARE WE DOING R&M?**
- **COSTS: WHAT ARE WE EXPENDING ON R&M?**
- **IMPEDIMENTS: WHAT KEEPS US FROM DOING R&M?**
- **INCENTIVES: WHAT HELPS US DO R&M?**
- **INITIATIVES: WHAT ARE WE TRYING TO DO IN R&M?**
- **RECOMMENDATIONS: WHAT SHOULD WE BE DOING?**

Figure II-3: Key Questions

The literature review team abstracted over 130 articles, papers, and studies identified from well over 1,000 available documents. A bibliography of these documents is included in Volume II, Annex J. This team sought to identify the recurring themes in the literature relative to each of the ten questions.

The policy and procedures team reviewed over 170 Department of Defense, Service, and command-level regulations and policies covering all functional areas related to R&M. A summary of regulations and procedures the team believed require revision in light of the new R&M emphasis is provided in Section III.

The organization and key personnel team visited over 50 Air Force offices, as well as several from the Army, Navy, and Office of the Secretary of Defense. They interviewed over 100 people assigned to R&M managerial, functional, and program positions.

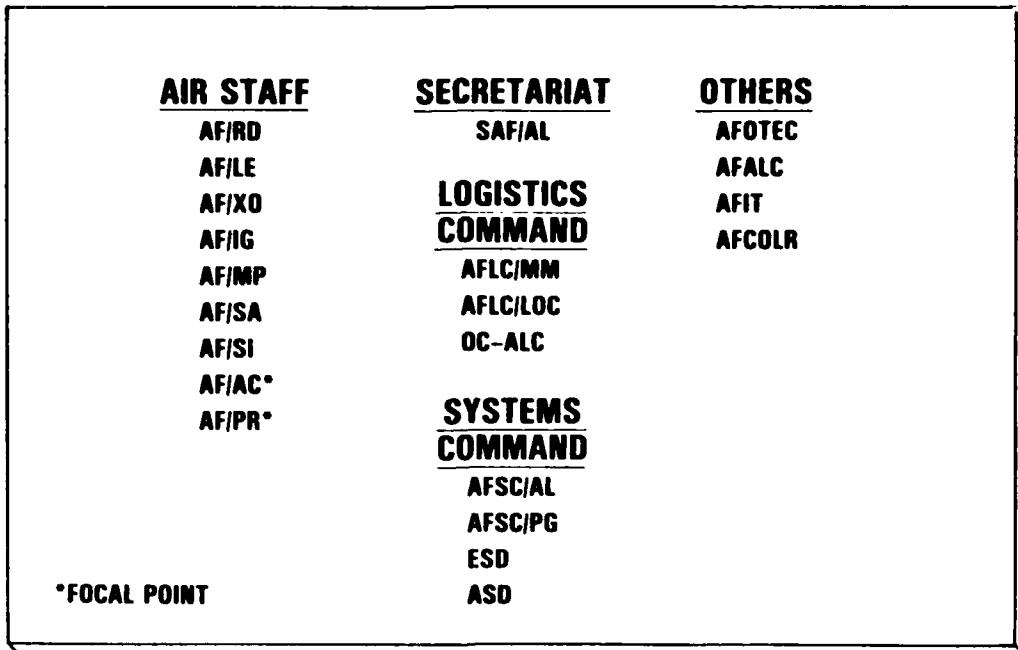


Figure II-1: Team Composition

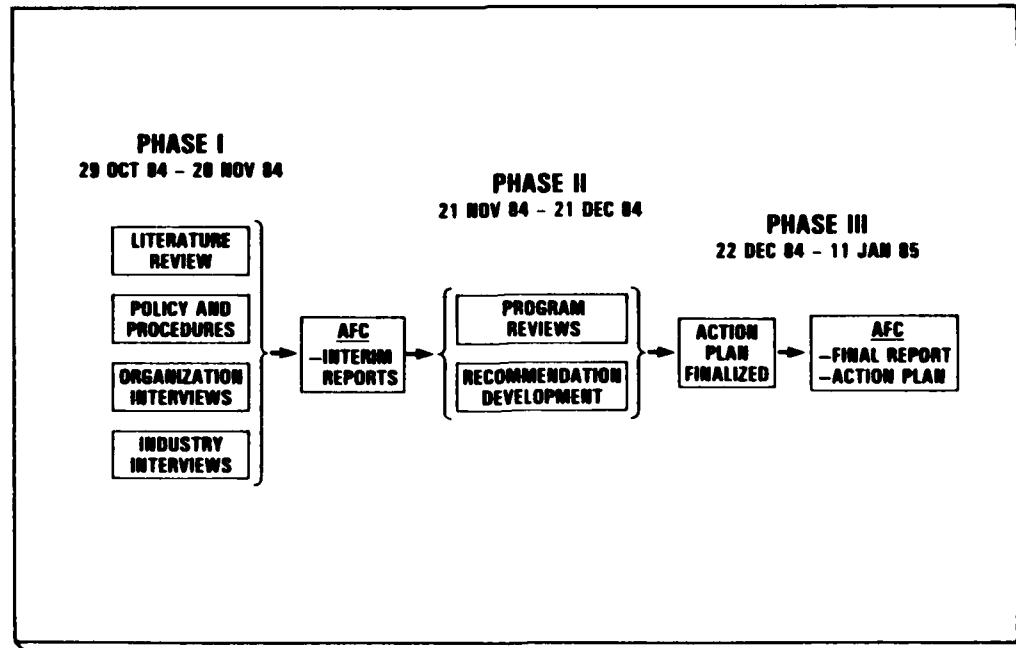


Figure II-2: Team Plan

sight. In short, the program managers, like their industry counterparts, wanted to avoid any movement toward micro-management.

Program managers believed planning requirements should be incorporated into existing acquisition plans. They supported better planning to include more formal R&M training and education for personnel during their careers to ensure a supply of educated and experienced R&M personnel. Early assignment of R&M engineering personnel into programs was strongly endorsed as was the assignment of a Deputy Program Manager for Logistics function in the laboratories to provide R&M emphasis during early development of concepts and systems.

They stressed the value of program stability and the need to counter the tendency for proponents of specific technologies or concepts to influence the development process to the detriment of the overall program. Of critical importance was the availability of funding for a corrective actions program on fielded weapon systems and the recognition that R&M development and improvement does not cease at Program Management Responsibility Transfer (PMRT) from Air Force Systems Command to Air Force Logistics Command.

Effective contractor interface was the way to achieve maximum leverage for improved R&M. Gaining contractors' attention requires senior-level Air Force involvement and increased R&M emphasis in the source selection process. Contractor R&M rewards and penalties were often not balanced with other incentives on performance or cost. The Air Force must be willing to apply negative incentives such as the withholding of payments. Publicizing both good and bad contractor R&M performance was providing considerable motivation for improved R&M.

The use of warranties in contracts was valuable when they were planned very early so that both sides could be prepared for implementation. It must be recognized that the government will pay either directly or indirectly for warranties. Finally, additional emphasis must be placed on R&M during design reviews with both operational and logistics personnel as active participants. It was during these early reviews that the hardware R&M was most effectively and efficiently impacted.

The program managers cited many R&M success stories. They recommended that all levels of the Air Force communicate and publicize these R&M success stories.

As summarized in Figure III-8, the program reviews verified the findings documented in Phase I. Realistic design requirements based on user requirements are essential to the acquisition process. R&M must be emphasized during early design reviews and must be visible in source selection. There are many R&M success stories that merit recognition and publicity.

- **SCOPE**
 - VISITED AFSC, AFLC, ARMY, AND NAVY PROGRAMS
 - INTERVIEWED OVER 90 PROGRAM PEOPLE
- **FINDINGS**
 - ECHOED FINDINGS FROM OTHER REVIEWS
 - NEED REALISTIC DESIGN REQUIREMENTS
 - EXPAND R&M EMPHASIS IN DESIGN REVIEWS
 - MAKE R&M VISIBLE IN SOURCE SELECTIONS
 - RECOGNIZE CURRENT SUCCESSFUL EFFORTS

Figure III-8: Program Review

F. Essential R&M Building Blocks for Management. The extensive data collected to this point was reviewed, collated, condensed, and analyzed from several perspectives. One of the efforts involved identifying the essential building blocks required for an effective R&M management program. The teams findings are listed in Figure III-9.

First and foremost in a successful R&M program was the requirement for top management commitment and involvement. Without this commitment, resources were not made available and the tough tradeoff decisions were not made. In most cases, the tradeoffs were made in the lower echelons of an organization and simply were not visible to higher management.

Field organizations repeatedly said, "Tell us what you want." The functional program staffs were confronted with many conflicting demands on time and resources. The Air Force must clearly communicate the priority of R&M objectives if these staffs are to be responsive to the call for increased efforts.

Interest in R&M was not enough. Interest must be backed by technical expertise at all levels. Expertise in R&M was a scarce resource and that which was available was scattered across the Air Force. This made itself evident in many ways, such as the variability of the quality of R&M programs briefed before the Air Force Board Structure.

- COMMITMENT AT THE TOP
- CLEAR COMMUNICATION OF OBJECTIVES
- TECHNICAL COMPETENCE
- CLEAR AUTHORITY AND ACCOUNTABILITY
- EFFECTIVE PLANNING
- STRONG REVIEW PROCESS

Figure III-9: Essential R&M Building Blocks - Management

Clear authority and accountability were essential elements. Without effective oversight in the program, R&M will remain only a consideration. One of the major findings of the initial team phases was that organizations were having difficulty in implementing effective R&M programs because of the inability to keep resources focused on R&M. Shared responsibilities and lack of organizational priorities were clear contributors to this dilemma.

Finally, benefits and impacts of R&M were not being made visible to decision-makers. Coordinated plans across commands, weapon systems, and technologies were needed to clearly communicate and track the R&M requirements. This must be followed by a strong review process to prevent erosion of R&M over the long acquisition cycle as it competes with cost, schedule, and performance pressures. The combination of the extensive acquisition cycle and the bureaucratic tiering in weapon system decision-making made a persistent R&M review process mandatory.

G. Essential R&M Building Blocks for Programs. A similar summary was developed for the essential R&M building blocks required for effective R&M in weapon system programs. The teams findings are listed in Figure III-10.

At the program level, clear requirements were the most essential building block for an effective R&M program, but they were also one of the toughest things to establish. Without measurable, verifiable, and enforceable requirements, there were no R&M requirements.

- **CLEAR REQUIREMENTS**
 - MEASURABLE, VERIFIABLE, AND ENFORCEABLE
- **EFFECTIVE CONTRACTUAL PROCESS**
 - REFLECTS REQUIREMENTS
 - CONTAINS R&M INCENTIVES/WARRANTIES
- **EMPHASIS DURING DESIGN/MANUFACTURE**
 - ITERATIVE DESIGN PROCESS
 - EFFECTIVE TECHNIQUES (DERATING, PARTS SCREENING)
 - IN-DEPTH TECHNICAL REVIEWS
 - REALISTIC TESTING

Figure III-10: Essential R&M Building Blocks - Programs

The contractors gave the Air Force what it demanded and rewarded. Therefore, R&M requirements must be clearly translated into the contractual process with a priority coequal to cost, schedule, and other performance requirements. Warranties and incentives must be planned early, be reflective of the R&M priority, and to the extent possible, be tied to performance in the field under operational environments.

Finally, R&M is put into our systems during design and must be maintained during manufacturing whether creating a new system or modifying an existing system. R&M is achieved through an iterative process with emphasis on effective techniques like derating and parts screening. This iterative process takes time, talent, and dollars to accomplish. At best, a good manufacturing process maintains the reliability inherent in the design. At worst, a poor manufacturing process can degrade an inherently reliable R&M design.

H. R&M Process. The R&M process is simple in concept and can be depicted as shown in Figure III-11. Two key factors that play throughout the entire process are understanding and conveying the needs (a good requirements process) and maintaining an effective feedback system (reliable data systems).

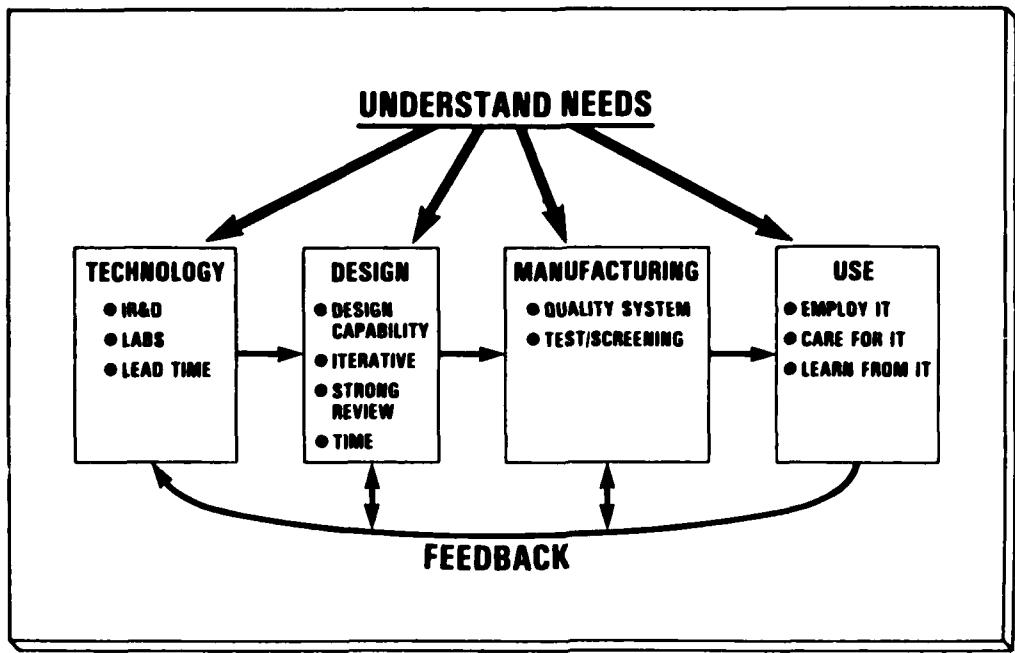


Figure III-11: R&M Process

Technology advances provide the capability to improve R&M. Independent Research and Development (IR&D) programs and in-house laboratory efforts must ensure R&M is incorporated into these new technologies, such as Very High Speed Integrated Circuits (VHSIC), lead time away from the designer's need to employ it. This will ensure new technology is not incorporated in weapon systems at the expense of R&M.

Design is where R&M goes into the system. At some point, a design engineer lays out the circuit or determines the structure. The design engineer can accomplish this during development (most efficient), during production (very disruptive), or as a modification (very expensive). If the design is not allowed to mature at one of these points, the only alternative is for the Air Force to learn to tolerate the negative effects. Design is by its very nature an iterative process, and it takes time. Strong in-plant review of R&M to verify design integrity is crucial. The Air Force must pay for R&M omissions in terms of support costs and availability for many years. The more time allowed for iteration during development, the more mature the system that goes to the field. Most reliability growth should be achieved prior to entry of a system into production.

Manufacturing cannot put R&M into the system, but it can degrade the inherent reliability of the design. Many recent quality problems involving weapon system production facilities were examples of degrading reliability through poor manufacturing discipline. A strong quality control system, including vigorous testing and parts screening, is an essential ingredient to any R&M program. The transition from design/development to manufacturing/production usually creates numerous contractor-requested changes for producibility. Producibility changes, like all design changes, must be carefully scrutinized for impact on R&M.

The user plays a crucial role in R&M. When the system gets to the field, the user cannot directly enhance R&M, but he can degrade it through ineffective maintenance, training, and operational procedures. The user is also the key player in any data system to feedback failure information in a timely and usable format to the engineers so they may influence technology, design, and manufacturing.

I. R&M Impediments. Just as the building blocks for R&M became apparent and were reflected in the data sources, so also were the roadblocks. To accelerate improvement, the Air Force will have to overcome several impediments indicated in Figure III-12.

- **PROGRAMMATIC PRESSURES—COST, SCHEDULE AND PERFORMANCE**
- **INABILITY TO DEFINE, TRACK, MEASURE, OR COST R&M**
- **ACCOUNTABILITY AND AUTHORITY LACKING**
- **R&M PERCEIVED AS LOW PRIORITY**
- **LACK OF ORGANIZATION FOCUS**
- **ACTIONS HAVE NOT LIVED UP TO WORDS**

Figure III-12: Impediments to R&M

The primary impediment was the inability of R&M to effectively compete with intense programmatic pressures to meet cost, schedule, and other performance requirements. The annual budget process and baseline constraints, schedules based on Initial Operational Capability (IOC) commitments to users and Congress, and continuous performance challenges that evolved in the face of increasingly sophisticated threats made tough competitors.

In addition to these very real challenges, R&M itself as a discipline had several problems. First, it was very difficult to define, track, measure, and cost. R&M impacts cannot be seen or felt for many years. For example, the logistics impact of the Advanced Tactical Fighter program will not be seen until the late 1990s, but the critical R&M program decisions were already being made. Life cycle cost estimates were not effectively quantifying the benefits from improved R&M, and therefore, R&M was not successfully competing with acquisition funds. Additionally, as previously indicated, accountability and authority had been lacking, R&M was perceived as a lowpriority effort, and organizational focus was not apparent.

Finally, past actions had not always lived up to words. Contractors often perceived the Air Force wanted performance and low acquisition costs. Contractors believed that is what had traditionally won the big contracts and would continue to do so. Air Force actions in source selections, with few exceptions, were perceived as not living up to our words on R&M.

J. R&M Initiatives. One final but very important point must be made in this section. The Air Force R&M story is not a negative one. During the extensive Phase I and Phase II reviews, the team found numerous positive initiatives and many concrete examples of effective R&M applications and growth.

There were many examples of hardware programs, such as the F-16 APG-66 radar and the Air Force Standard Inertial Navigation Unit, where significant R&M improvements had been fielded. In the management area, the Avionics Improvement Program at the Aeronautical Systems Division or the Back to Basics program at the Electronic Systems Division were creative management initiatives aimed at implementing proven and disciplined R&M approaches. The Aeronautical Systems Division's effort was aimed at applying to avionics the R&M philosophy successfully used on structures and engines. Electronic Systems Division's program was attempting to remove some of the complexity from R&M and provide proven R&M techniques in readily usable formats to program offices. Many Air Force organizations had widely respected expertise such as the Rome Air Development Center, recognized worldwide for their work in electronic component reliability.

The dedicated efforts of Air Force people and organizations and the advance of technology had fueled a steady improvement in R&M. In fact, Air Force systems had consistently, and in some cases dramatically,

improved R&M performance. For example, the F-16 required only 50% of the maintenance manhours per flight hour as the F-4. The Minuteman I guidance system failed about every 600 hours when first fielded in 1961. Today, after a modest investment in improved reliability, the Minuteman guidance system enjoys a mean time between failure of over 10,000 hours. The findings and conclusions in the next section outline how the Air Force can broaden and accelerate this R&M improvement.

SECTION IV: DISCUSSION OF CONCLUSIONS AND ACTION PLAN RECOMMENDATIONS

The team found that there were no major technical roadblocks to improved R&M and that, in fact, there was real potential for accelerated R&M improvement. Moreover, operational necessities and logistics support considerations over the next several decades demand that the Air Force capitalize on this potential or risk declining combat effectiveness. The information gathered in Phase I and II was substantial, but it was also surprisingly consistent and provided a clear indication of what had to be done if the Air Force was to accelerate R&M improvement.

Many of the R&M problems discussed were longstanding and seemingly intractable. Various functional and program communities within the Air Force had attempted to resolve them many times with limited success. Therefore, a fundamentally different approach was required.

Previous initiatives had for the most part concentrated on technical solutions rather than the organizational environment. Consequently, conflicting organizational objectives and differing motivations diminished the impact of otherwise realistic solutions. Instead of concentrating on technical solutions, it was clear that a cultural change was needed in the managerial environment if institutionalization of the R&M commitment was to be successful. As a natural consequence of this cultural change in R&M management, program and technical R&M improvements would be encouraged and have a high probability of success.

To bring about a fundamental change in the way the Air Force manages R&M, six management objectives were developed by the team as shown in Figure IV-1.

- **PROVIDE CLEAR DIRECTION THROUGH VISIBLE R&M GOALS AND POLICY TO INCREASE COMBAT EFFECTIVENESS**
- **ESTABLISH ORGANIZATIONAL FOCUS AND EXPAND TRAINING TO BUILD R&M TECHNICAL EXPERTISE, ADVOCACY, AUTHORITY, AND ACCOUNTABILITY**
- **IMPROVE R&M PLANNING TO CONSOLIDATE EFFORTS, TIE R&M TO OPERATIONAL GOALS, AND COORDINATE ACROSS COMMANDS**
- **ENSURE EFFECTIVE ACCOUNTABILITY AND FEEDBACK TO MEASURE PROGRESS IN THE R&M IMPROVEMENT PROGRAM**
- **PROVIDE POSITIVE COMMUNICATION AND MOTIVATION TO SUSTAIN COMMITMENT TO AND SUPPORT FOR R&M IMPROVEMENT**
- **OBTAIN INDUSTRY COMMITMENT TO ENSURE THAT CONTRACTORS HAVE THE MOTIVATION AND CAPABILITY TO SUPPORT R&M REQUIREMENTS**

Figure IV-1: R&M 2000 Objectives

They were designed to sustain top management's commitment to R&M, focus Air Force resources on effective R&M, and convince both Air Force and contractor organizations of its importance. Their implementation was intended to directly influence the key decision-making and communication channels throughout both communities.

A. OBJECTIVE I: Provide Clear Direction. The team verified in each of the five data sources that one of the critical elements needed to accelerate R&M improvement was senior-level management understanding, emphasis, and commitment to R&M. Often in previous system acquisitions, design tradeoffs had accommodated cost, schedule, or performance at the expense of R&M (and consequently combat effectiveness and operational supportability). In the modification of fielded systems, funding decisions were often made without explicit insight as to relative impacts on combat effectiveness and operational supportability. For example, the traditional measures of Mean Time Between Failure and Mean Time To Repair used to gauge R&M management improvement had not been consistently linked to measures of combat effectiveness such as availability and mission success probability. This lack of understanding, emphasis, and commitment could be rectified by establishing clear direction for R&M improvement through visible goals and policy tied to combat effectiveness and operational supportability. The actions required to support this objective are shown in Figure IV-2 and discussed below.

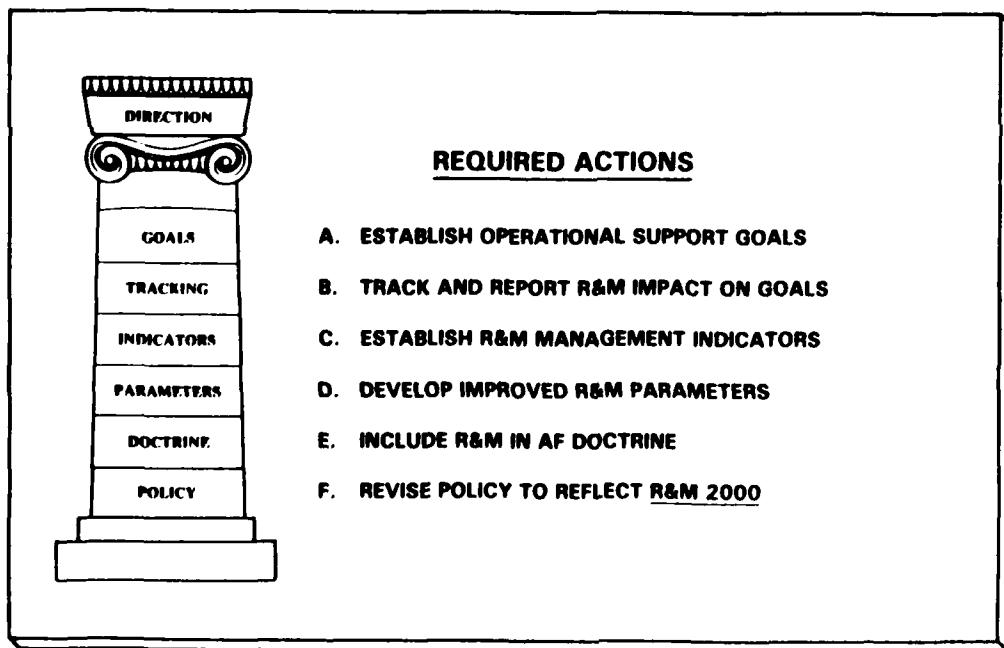


Figure IV-2: Provide Clear Direction

To enhance combat effectiveness and operational supportability through improved R&M, there must be a set of goals to provide organizational direction, relate R&M to operational factors, and provide visible means of showing progress. The Air Force needs greater readiness, durability, and mobility at less manpower and logistics support cost. R&M is one of the most effective means of satisfying these needs concurrently. However, there are questions of balance between these needs that require coordination with the major commands before specific numerical targets can be assigned.

Therefore, the team recommended beginning with directional goals that provide a check and balance between combat effectiveness and operational supportability. First, the Air Force should seek improved readiness by increasing availability. Although there are a number of different availability parameters, they all measure the capability of a system to engage in its mission.

Second, the Air Force should pursue increases in a system's propensity to sustain combat operations without critical failure. This durability issue can be measured by mission success probability or mission reliability wherein the propensity for critical failure-free operations is measured against various combat mission durations.

Third, the Air Force should lower manpower requirements through improved R&M, thereby decreasing total maintenance manpower authorizations. The Census Bureau estimates that the pool of 18-24-year-old military-eligible males will decrease by 18% in the next ten years. Presuming the percentage of the work force willing to join the Air Force will remain constant in the next decade (assuming no return to a draft, no relative decline in military benefits, and no collapse in the economy), work force restraints may limit Air Force maintenance manning to as few as 164,000 authorizations by 1995 versus 200,000 authorizations presently available.

Fourth, the Air Force should decrease logistics support costs. This goal, coupled with that of reduced maintenance manpower spaces, ensures improvements in combat efficiency are not "purchased" with increasingly scarce logistics and manpower resources.

Fifth, the Air Force should improve the mobility of our forces to quickly deploy and widely disperse with minimal reliance on logistics support. The Air Force must decrease mobility requirements and enhance the effectiveness of airlift forces. Future battlefield environments will provide an advantage to the most survivable, mobile, and flexible combatants.

Once a set of corporate R&M goals has been established, major commands must track, project, and report the command and weapon system R&M impact on these goals. This tracking must be accomplished by operating commands, since they must ultimately live with or demand changes in the R&M performance of their systems. Weapon system reporting by Air Force

Systems Command and Air Force Logistics Command will provide a composite view of weapon system R&M across commands. Semiannual reports to Air Staff would furnish the data necessary for budgetary support, R&M problem identification, and the basis for assessing progress. The purpose of a goal program is to make R&M impacts visible to management and to educate our personnel on the relationships between R&M, combat effectiveness, and operational supportability.

Commands may want to measure R&M goals with differing indicators due to variances in systems, missions, and environments. Such differences are reasonable as long as they are based on sound rationale, are consistent over time, and relate to the operational support goals. The Air Staff must monitor management indicators proposed by the major commands to ensure there is an audit trail that accurately reflects the impact of R&M improvements on these goals. The development of management indicators will be an iterative process, with proper care for consistency and without sacrifice of historical perspective.

Linking R&M directly to operational effectiveness is a complex and difficult task, but it is the foundation for a successful R&M program. It will point the way and provide the rationale for undertaking the R&M improvement initiatives. Therefore, it is of prime importance that the goal program be initiated as soon as possible. Measurement parameters for R&M will be based on data currently available in our management information systems such as the Maintenance Data Collection (MDC) system; the Aerospace Vehicle Inventory, Status, and Utilization Reporting System (AVISURS); and the Visibility and Maintenance of Operational Support Costs (VAMOSC) system. It is recognized that both the R&M parameters and data systems require improvement. Independent efforts will be initiated to address both of these generic R&M issues.

Changes in environment and technology require the development of new R&M parameters that more directly relate to operational support goals. The Air Force must take immediate action to develop improved R&M measures. The team worked closely with independent organizations, such as the Rand Corporation, throughout the effort to identify current parameters and to establish a plan to develop better measures. Close coordination between Air Staff and major command organizations is necessary to select the specific parameters and programs that will be included in the initial goal program.

AFM 1-1, Basic Aerospace Doctrine of the United States Air Force, describes the proper use of aerospace forces in military action and provides broad guidelines for employing forces. Air Force doctrine addresses the need for "reliable systems, in adequate numbers, and with the capability to survive and be maintained in all combat environments." It calls for equipping aerospace forces with enduring systems "... that possess an optimum mix of the fundamental characteristics of speed, range, and flexibility ..." and for sustaining these forces with a simple, secure, and survivable logistics system. Reducing the probability of component failure and improving the repair turnaround process can

affect simultaneous improvement in both equipping and sustaining aerospace forces. Accordingly, these R&M concepts should be explicitly incorporated into the Basic Aerospace Doctrine as fundamental to war-fighting capability.

Finally, Air Force policies and procedures must be updated to reflect the new R&M commitment. The team identified some disconnects in current policy and areas that need R&M emphasis, as shown previously in Figure III-2. The new Air Staff R&M organization should use this as a starting point to ensure R&M policy is consistent with the thrusts of the action plan and update AFR 800-18 to incorporate the new R&M management systems outlined in this plan. However, discipline in the implementation of existing policy remains a more important priority than creating or clarifying policy. This subject is further addressed under accountability in Objective IV.

The above actions are intended to provide clear R&M direction throughout the Air Force for organizations, systems, and technologies. They will link R&M improvements directly to operational needs and ensure there is a sound doctrinal and policy base for the improvement program.

B. OBJECTIVE II: Establish Organizational Focus and Expand Training. Included among the major impediments to improved R&M identified by the team were the lack of a visible R&M organization, fragmented direction, and unclear authority, responsibility, and accountability. This had resulted in a lack of trained, experienced R&M personnel and the absence of career potential for many working directly in the field. The actions required to establish organizational focus and expand training and development programs are shown in Figure IV-3 and discussed below. Given that direction and necessity are established by Objective I, this area was intended to ensure there is organizational competence to manage the improvement effort and to provide advocacy, accountability, and focus for Air Force R&M.

The consensus from all sources was that R&M advocacy was needed and that it must have the visibility and authority to directly affect R&M at all levels within the Air Force. Unlike the Army and Navy, the Air Force has weapon system development and support responsibilities split between two major commands. To assure continuity and hasten R&M improvement, the Air Staff must assume a more active role than it has in the past. The team reviewed and analyzed several Air Staff organizational alternatives and recommended that a Special Assistant for R&M be established. The Special Assistant for R&M would report directly to the Deputy Chief of Staff level and would have a staff of 10 to 12 action officers. A charter was developed and approved that gave the Special Assistant the authority to act as the Air Staff R&M advocate, establish policy, conduct reviews, foster commitment, coordinate training and personnel development efforts, and carry out communication and motivation programs. The charter for the Special Assistant is contained in Volume II, Annex I.

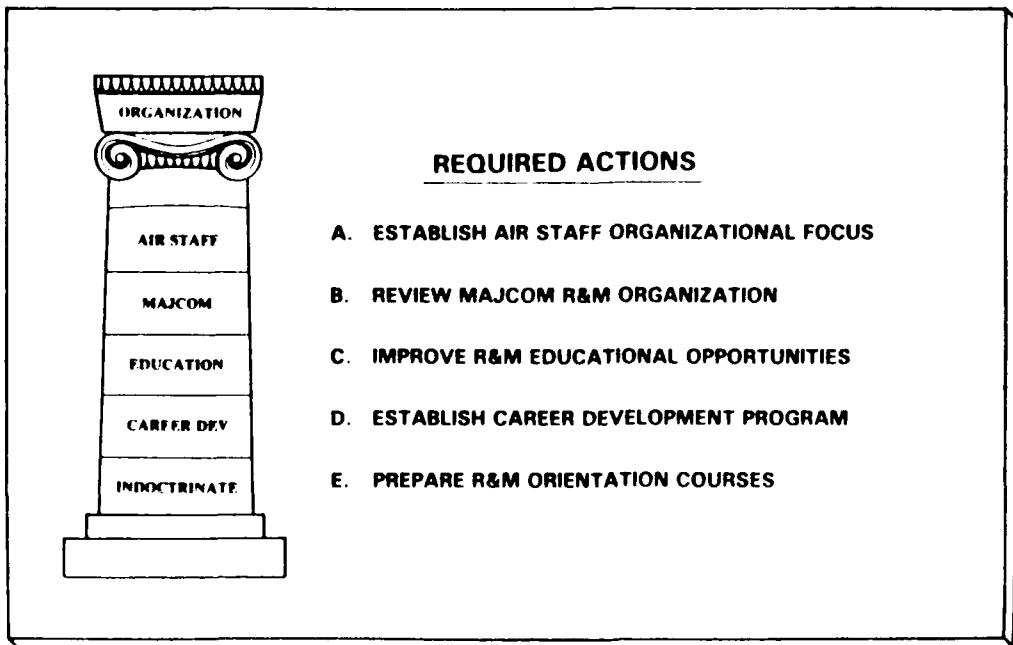


Figure IV-3: Establish Organizational Focus and Expand Training

The institutionalization process depends on the major commands implementing the program throughout their commands. Therefore, it is essential the major commands review their organizational approaches to verify they have the capability to implement the action plan within their commands. With the new Air Staff organization in place, the field R&M focal points will have the opportunity for increased support for their initiatives. A close working relationship between the Air Staff Special Assistant for R&M and major command R&M organizations is envisioned and necessary.

Education and training are important to the growth of a technically competent R&M cadre and to increased sensitivity to R&M at management levels and within related functions. Although there are substantial R&M educational opportunities available within the Air Force Institute for Technology and other Service schools, R&M training had not received a high priority. For example, less than one percent of the total Air Force systems engineering authorizations with advanced academic degree requirements in 1984 were for R&M engineering. An expanded and improved R&M educational program must be initiated to increase the capabilities and expertise of R&M technical and managerial personnel.

APPENDIX 1

SECAF AND CSAF MEMORANDUM, 17 SEPTEMBER 1984

The support of this project, the approval and commitment to R&M 2000, and the establishment of the Air Staff Special Assistant for R&M are ample evidence of the renewed corporate Air Force interest in improved R&M. Implementation of R&M 2000 will establish the environment in which R&M innovation can flourish and carry the current commitment into the future. However, R&M institutionalization is a long-term effort and will require periodic rededication and reaffirmation by leaders, program offices, and technicians. Improved R&M has been an evasive goal for the Air Force. It is because of this R&M 2000 was written. The plan is designed to make poor R&M in new weapon systems more visible and in fielded systems less tolerable. Effective implementation of R&M 2000 will change the way the Air Force manages R&M and will lead to improved operational effectiveness and efficiency.

SECTION V: SUMMARY

The R&M Action Plan Development Team was commissioned to develop recommendations that would institutionalize the Air Force commitment to R&M and thereby enhance combat efficiency and operational supportability. Based on the conclusions and recommendations discussed in Section IV, 37 specific actions were developed and proposed. These actions support the six major objectives and together form the USAF Reliability and Maintainability Action Plan, R&M 2000 (Appendix 2). Figure V-1 depicts the objectives and actions that constitute R&M 2000.

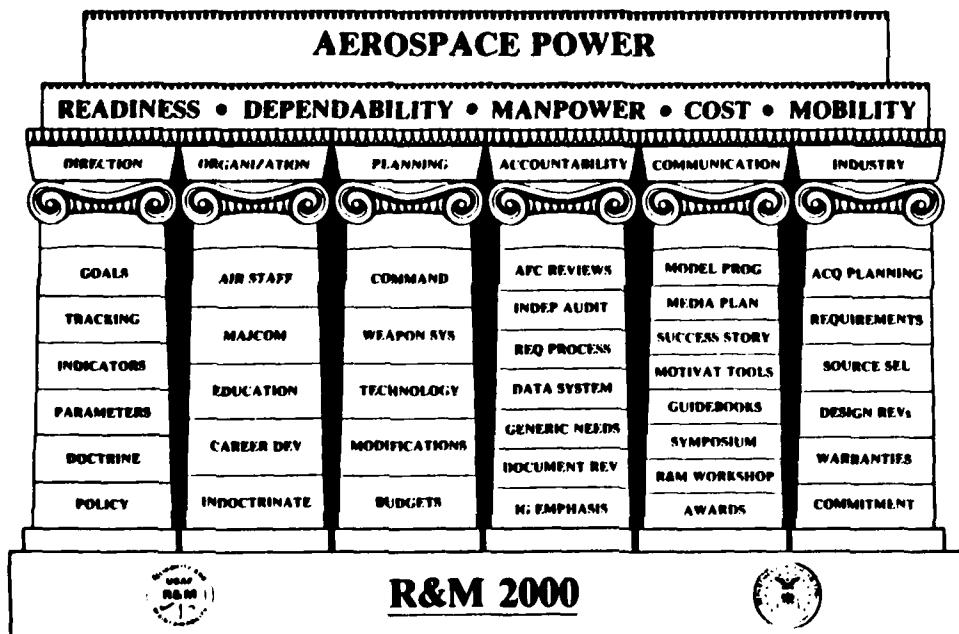


Figure V-1: R&M 2000 Objectives and Required Actions

R&M 2000 was briefed to the Secretary of the Air Force and Chief of Staff on 23 January 1985 and was approved on 1 February 1985. R&M 2000 will serve as the Air Force charter for accelerated R&M improvement. The actions in the plan are managerial in nature and are reflective of the top-level concern for and commitment to R&M improvement. R&M 2000 is no panacea; its effectiveness will remain a function of managerial commitment and persistence as it proceeds to the implementation phase. R&M improvements will be the result of technical innovations and managerial decisions made by thousands of individuals throughout the Air Force and industry.

proven successful in the past is the use of product performance agreements such as warranties, guarantees, award fees, and other special contractual incentives. When properly applied, these agreements can provide two specific benefits. First, they can be an effective means of assuring visibility and emphasis by government and contract management on achieving R&M requirements. Second, they can provide tangible and intangible rewards such as improved performance, reliability, and quality; reduced life cycle cost; early and rapid problem resolution; realistic field performance estimates; contractor responsibility for field performance; improved field performance evaluation; and contractor motivation in design and production.

However, these agreements alone cannot achieve increased R&M. They must be an integral part of an overall R&M program carried throughout the design and development phases and must be based on a clear statement of system requirements. Presently, a more effective use of product performance agreements is hampered by the absence of formal reporting requirements and consistent policy and direction. The Air Force had established the Product Performance Agreement Center (PPAC) to assist in correcting these deficiencies and to facilitate the effective use of product performance agreements by Air Force acquisition activities. However, the PPAC manning level has severely limited the technical assistance that it had been able to provide. The Air Force must enhance the use of product performance agreements by establishing and implementing an aggressive policy for their use, improving warranty administration, providing direct assistance to program offices in this area, intensifying management review of product performance agreements, and increasing the effectiveness of the PPAC.

Finally, obtaining highly reliable and maintainable weapon systems is necessarily a cooperative effort between the Air Force and industry. Neither alone can successfully incorporate R&M into the design, development, and production of weapon systems. The Air Force must foster programs that institutionalize R&M within industry to ensure their capability to effectively respond to this Air Force initiatives. The Air Force Systems Command and Air Force Logistics Command must establish programs with key aerospace manufacturers that will establish and assess their commitment and capability to accelerate R&M improvements.

The first five objectives discussed in this section are primarily aimed at the Air Force organization, even though their implementation will indirectly influence industry. Objective VI is aimed directly at acquiring industry's commitment to R&M. The actions above are designed to ensure the contractor organizational commitment and technical capability are available to meet the Air Force demand for accelerated R&M improvement.

performance agreements, and the accountability of government and industry program managers in attaining R&M requirements is dependent on this requirement translation process. Without contractually enforceable R&M requirements, no basis exists for demanding improved R&M, nor is any improvement likely.

Solicitations for major weapon systems contain many requirements, goals, and incentives. For a contractor preparing a proposal in response to a solicitation document, it is essential to know which provisions are most important, what the relative weights of the various requirements are, and on which criteria the source selection will be based. Insight into these issues is normally found in a solicitation's "Evaluation Factors for Award" section and in the "Executive Summary Letter" accompanying the solicitation. Regardless of any other Air Force initiatives, contractor proposals and resultant contracts will reflect increased emphasis on R&M only to the degree contract award factors clearly identify R&M as an Air Force priority. Program requirements and characteristics vary widely, making a single method of emphasizing R&M in source selection difficult to specify. However, industry consistently repeated the theme that the most effective leverage to achieving improved R&M is through the source selection process. Consequently, it is essential that program and system managers are fully aware of the importance of R&M to the Air Force and that this interest is conveyed to potential offerors through source selection documents and an increased consideration of R&M in source selection.

A successful R&M program must include concise requirements in the specifications and statement of work as well as emphasis in the contract award factors. Once requirements are delineated, the importance of R&M is established in the award factors. After the contract is awarded, R&M emphasis must be continued throughout the contractual design review process. The contractor is responsible for conducting design reviews as described in MIL-STD-1521A and ensuring the reviews are also being adequately conducted by subcontractors. The Air Force program manager usually serves a cochairman of the design review, approves the agenda, participates in the review, and assesses its adequacy. During this process, the Air Force Systems Command and Air Force Logistics Command program managers must insist that R&M be specifically considered during the review in a manner coequal to cost, schedule, and other performance requirements. This must be reflected in visible ways such as the level of management participation in the reviews, the capability of Air Force technical expertise attending the review, the agenda priority of R&M, and the resultant action items and reports.

To successfully motivate contractors to improve the R&M of their products, the Air Force must make it to their advantage to do so. In the private sector, market forces, such as market share and competition, provide adequate incentive for achieving acceptable levels of R&M. Similar motivations do not always exist in the defense industry, making it necessary for the Air Force to create these incentives. One technique

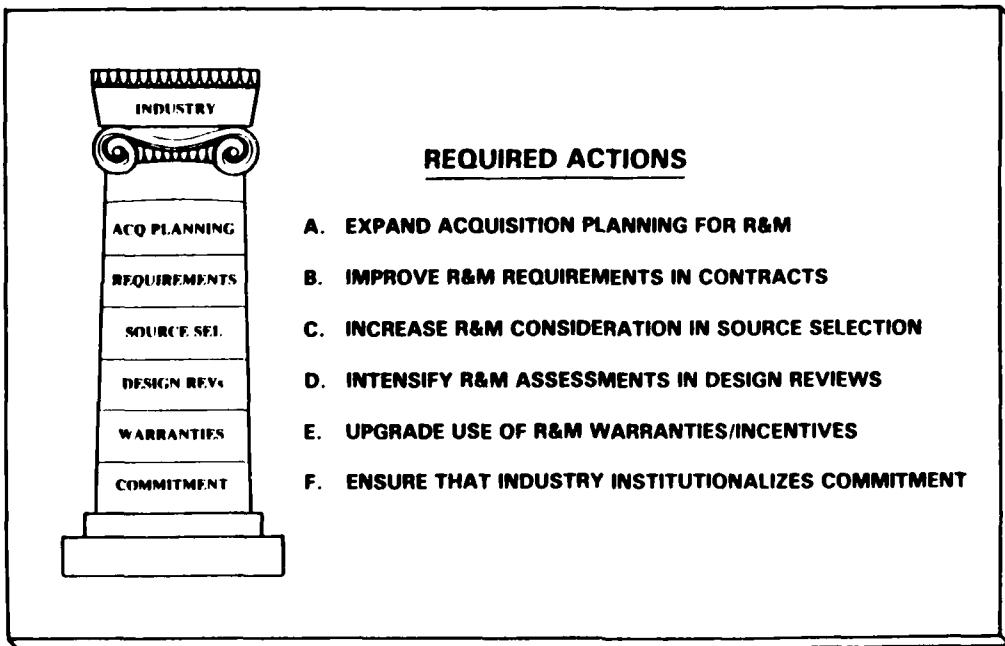


Figure IV-7: Obtain Industry Commitment

Acquisition strategy determines the focus and direction of our acquisition and modification programs. It is the basis for developing source selection criteria, product performance agreement approaches, and contract content. An integral element of that overall strategy must be the plan for achievement of a reliable, maintainable system. Current acquisition strategy did not adequately address R&M, making it unlikely that formal communications with industry would be effective. For example, Program Management Directives did not as a matter of course include R&M objectives, address the overall importance of R&M in the program, or provide R&M taskings. The Program Management Plan did not always include an R&M management plan or adequately address R&M issues such as concurrency or the transition from design to production. These considerations must be incorporated into weapon system acquisition strategies, supported by revised policies and procedures, and reviewed by program and R&M organizations.

The primary mechanism for institutionalizing Air Force R&M commitment is the contracting process. Documents such as the system specification, statement of work, and data requirements list form the basis for system (or modification) design, development, and acceptance. Measurable, verifiable, and enforceable R&M requirements in these documents are absolutely essential. The success of related actions such as increasing the emphasis of R&M in source selection, the effective use of product

All levels of the Air Force must be convinced of the importance of R&M improvement. Motivational tools such as pocket guides, data sheets, and poster campaigns are proven methods of reinforcing fundamental concepts, generating interest, and maintaining momentum.

Program and system managers often encounter competing demands for limited resources and need clear guidance on how to balance these demands. Guidebooks for new managers and engineers will provide useful case studies and outline the standard elements of a successful R&M program.

Another method for communicating Air Force commitment is to hold symposia. A senior-level Air Force and industry symposium would provide the opportunity to communicate a continuing commitment to R&M, address progress, identify future directions, and promote cross-fertilization of ideas and initiatives. A symposium approximately one year after the dissemination of the Action Plan would be an opportune time to assess mutual programs and reinforce the commitment to R&M.

The annual Air Force Systems Command / Air Force Logistics Command R&M workshop had provided an excellent forum for the exchange of technical information among R&M functional experts. Expanding this workshop to include managerial topics and encouraging program and system program manager attendance could provide an energetic forum for improved dialogue between management and R&M functional experts.

Finally, outstanding R&M contributions must be rewarded. This will assist in sustaining support for R&M and challenging others to excel. An annual Air Force award should be established and presented by senior Air Force leadership to acknowledge individual and organizational R&M excellence.

Together these actions are aimed at providing and sustaining organizational support for the R&M program. They will ensure R&M needs and opportunities are communicated and R&M achievement is recognized.

F. OBJECTIVE VI: Obtain Industry Commitment. The Air Force does not design or build R&M into systems. Industry necessarily has that responsibility. Therefore, contractors must be committed to this effort or the Air Force cannot be successful. Industry sources expressed skepticism that the current shift in emphasis on R&M would result in any real change. In the past, Air Force acquisition practices have not always signaled that R&M was as important as our words had indicated. Without full industry commitment, little improvement is likely. It must be evident that producing highly reliable and maintainable systems, subsystems, and equipment is good business. Effective Air Force contracting methods must be the primary vehicle for obtaining industry commitment and achieving accelerated R&M improvements. The actions required to support this objective are shown in Figure IV-7 and discussed below.

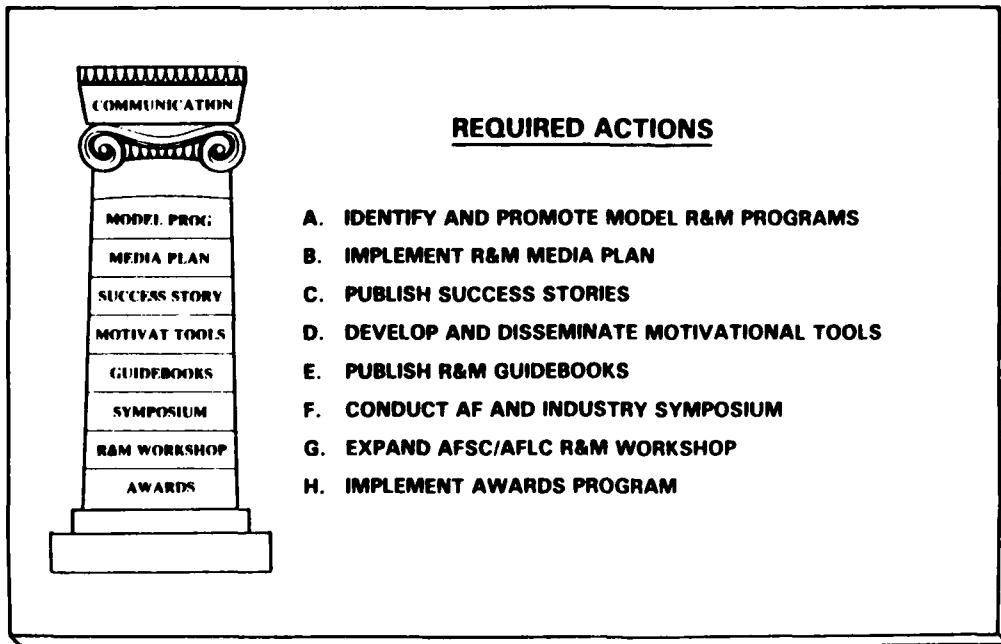


Figure IV-6: Provide Positive Communication and Motivation

Successful R&M programs stood out because of managerial and technical traits such as strong management commitment, excellent growth programs, and well-stated requirements. The Air Force must identify outstanding R&M programs in the technology, development, production, and modification phases of the life cycle to serve as models for emulation. These programs will become the standards by which other programs can be structured and evaluated.

Communicating and maintaining R&M commitment were shown to be crucial steps in convincing industry and Air Force people of the importance of the R&M improvement effort. A coordinated communications effort is required to promote success stories, lessons learned, motivational tools, guidebooks, senior management symposia, and award programs. This effort should initially focus on internal information publications but, as necessary, can include the media and congressional statements.

The renewed emphasis on R&M was not the result of horror stories. In fact, the Air Force has many R&M success stories. Publication of these on a regular basis will help sustain interest and support. In addition, lessons learned and technical articles will be encouraged to foster R&M improvements as well as motivation.

To build strong R&M programs and to evaluate their effectiveness, an active staff assistance and IG surveillance program must be instituted. The aim of this assistance and surveillance is to encourage innovation and ensure compliance with Air Force R&M policy and procedures. The new Air Staff focal point will provide a vehicle for advocacy of R&M issues and programs at the highest level of Air Force decision making. Their success will depend on the effectiveness of the major command and Air Staff relationships. This action plan will require close coordination between these staffs to establish the new goal, planning, and weapon system review programs that form the basis of the Action Plan. The IG, on the other hand, will ensure that we are in fact doing what we say. After the Action Plan implementation is underway, the IG should increase their surveillance level of R&M activities in organizational, functional, program, and operational reviews.

Together, these actions are intended to increase and strengthen the weakest link in our previous attempts at improving R&M, which is the lack of follow-through or accountability. These actions are designed to make R&M actions and decisions more visible to management and thereby make R&M deficiencies in new and fielded systems less tolerable. They will ensure that R&M improvements are supported and that progress is being achieved.

E. OBJECTIVE V: Provide Positive Communication and Motivation.
Maintaining top management support and communicating the need for R&M improvement across the Air Force were found to be the most essential ingredients of a successful R&M effort. Many sources had indicated that a general lack of management understanding, emphasis, and commitment had impeded R&M improvements. The perception within both the Air Force and industry was that R&M had a low priority and was a "no-win" issue.

Industry had expressed skepticism of increased Air Force emphasis on R&M because of past experiences where R&M innovation had not been rewarded and was often stifled. This problem was manifested in the program offices where R&M was often not emphasized or was readily or unknowingly traded for achievement of cost, schedule, or performance objectives. To reverse these attitudes, an extensive communication and motivation program is required. The actions required to support this objective are shown in Figure IV-6 and discussed below.

and Program Management Directives (PMDs). This methodology must result in R&M parameters capable of translation into measurable, verifiable, and enforceable contract requirements. Improvements in the requirements process demands immediate and continuous attention.

R&M performance tracking, mandated by DODD 5000.39 and 5000.40, is required throughout the life cycle of a weapon system. There were deficiencies, however, in the current audit trail of basic R&M parameters, especially between the acquisition and logistics processes. Tracking of actual performance to established requirements is necessary to ensure R&M requirements are achieved during acquisition and maintained throughout ownership. Consequently, the Air Force must develop and maintain a data collection method that tracks measurable R&M parameters throughout the life cycle of all systems.

The current AFM 66-1 data system was not designed for reliability feedback. Many Program Offices, therefore, have attempted to create their own data systems to fill this void. Some of these were quite successful, but duplication and costly development detract from their overall merit. Many new automated data systems are under development, especially within Air Force Logistics Command. They offer potential for R&M feedback application. These efforts must be coordinated and a firm R&M data collection plan established.

The need to develop an effective R&M data system, along with the improvement of the requirements statements addressed above, were clearly the two most challenging generic R&M issues facing the Air Force. The Air Staff R&M organization must take the lead in addressing these two pressing but long-term needs.

Often the Air Force will experience R&M problems on subsystems or components common to many weapon systems. However, because of the relatively low importance of the item in any particular system, they cannot successfully compete for modification funding. While they may be too small for an individual program to worry about, they have considerable R&M impact across the Air Force. There was no effective system to track generic R&M performance, identify potential R&M innovations, and transfer this information across applicable weapon systems. Such a capability would provide an effective source for R&M improvements.

To ensure users' R&M requirements are logical, attainable, and consistent, the Air Staff R&M organization must also review selected weapon system requirements documentation to include statements of need, program management directives, decision coordinating papers, requests for proposals, source selection plans, acquisition plans, and R&M plans. These documentation reviews will be part of the coordination and validation process and will support the weapon system reviews. As with program reviews, they must be limited to selected systems at the Air Staff level with each command establishing the review level and scope appropriate for their circumstance.

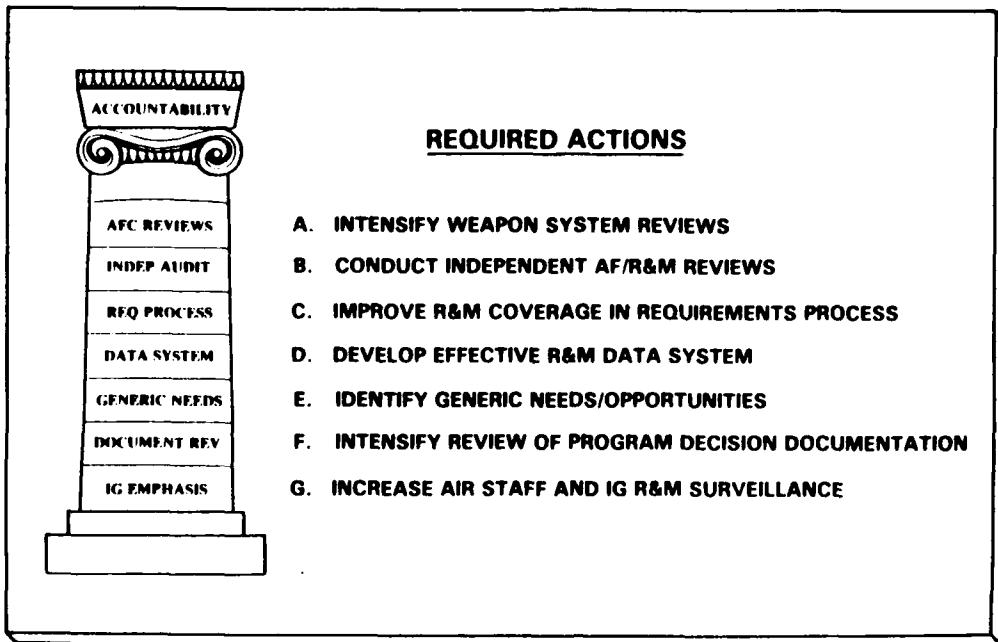


Figure IV-5: Ensure Effective Accountability and Feedback

To establish effective R&M accountability, the Air Staff R&M organization should review selected weapon system programs to provide technical R&M support and advice to the Air Force Board Structure. These reviews should include the adequacy of a weapon system's R&M program to satisfy users' requirements, the impact of the system upon operational support goals, and the effectiveness of the R&M tasks and initiatives being accomplished or planned for the program.

If R&M is to be made equal with cost, schedule, and performance, it must be treated with the same technical and managerial discipline the Air Force applies to these other factors. Therefore, independent R&M analyses should be conducted on selected programs analogous to the Independent Cost Analysis (ICA) concept in use by the comptroller community. These reviews would result in recommendations to the Air Force Board Structure on the advisability of proceeding to the next phase in the acquisition cycle and an assessment of the soundness of the R&M planning, projections, and budgetary support.

One of the most difficult but essential aspects of an R&M program is the clear statement of the users' needs directly related to operational requirements. The Air Staff R&M organization must play an active role in influencing the methodology and timely establishment of R&M operational needs in requirements documents such as Statements of Need (SONs).

R&M improvements for fielded systems are basic to any near-term enhancement of combat efficiency or operational supportability. Consequently, system program managers must continually review the R&M programs of their respective systems in concert with the using commands to identify which systems would most benefit from R&M modifications or the use of preferred spares. Air Force Logistics Command should prepare an annual integrated weapon system modification plan that details proposed modifications and preferred spares initiatives. This plan should prioritize the proposed weapon system improvements and relate them to the operational support goals. Justification should include both R&M cost-benefit analyses and combat efficiency considerations.

Finally, R&M organizations should address the fiscal resources necessary to sustain R&M improvement. The quantification of R&M budgets is inherently difficult because R&M activity is not easy to segregate, especially in the design and development activities. However, specific R&M-related programs, such as the Productivity, Reliability, Availability and Maintainability (PRAM) program, Component Improvement Program (CIP), Class IV modifications, and sustaining engineering, should be tracked. New fiscal programs for future investment in R&M improvement should be formulated as necessary. The Air Staff Special Assistant for R&M should play a primary role in advocacy of R&M budgets and provide direct technical inputs as an advisor to the Air Force Board Structure.

The above actions are designed to ensure there is a clear roadmap for the R&M improvement program. R&M initiatives will be tied to operational support goals and coordinated across commands, weapon systems, and technologies.

D. OBJECTIVE IV: Ensure Effective Accountability and Feedback. The Air Force had often stated its concern for logistics shortfalls caused by less than optimal R&M. Air Force policy and procedures, as noted earlier in this report, do provide an adequate basis for effective R&M programs. However, more discipline in implementation is required.

Among the deficiencies noted in current R&M management was the lack of traceability and accountability for R&M decisions. For example, there was very limited "cradle to grave" tracking of R&M parameters as required by DODD 5000.40. When R&M performance expectations were not met on a fielded system, the impacts were not readily visible. Reliability tracking systems were often devoid of reliability requirements data. In some cases, to detect reliability "problems," statistical quality control techniques were used in conjunction with historical levels of reliability performance. As a consequence, initially low or moderately deteriorating R&M performance characteristics did not receive proper management attention. The following actions shown in Figure IV-5 are designed to put accountability and managerial control into the R&M program.

initiatives being implemented and planned to achieve the system requirements. Weapon system R&M plans should be coordinated with affected commands, and their content should be consistent with the command plans discussed above. R&M plans will be written for both fielded systems and those under development. Several related planning requirements already exist, and R&M planning can be incorporated into these plans where that is deemed most efficient. The purpose is to provide clear roadmaps for weapon system R&M development, control, and improvement.

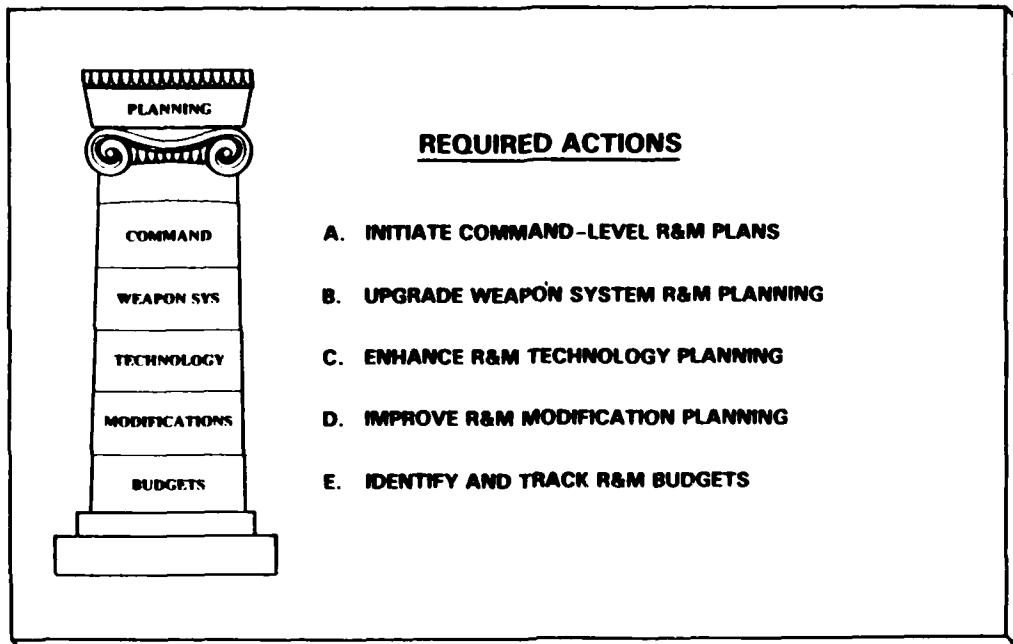


Figure IV-4: Improve R&M Planning

Air Force Systems Command and Air Force Logistics Command need to plan for generic R&M improvements and strategies that may surface as a result of new or improved technology. Air Force Systems Command and Air Force Logistics Command must prepare annual technology plans that address such issues as user needs, key technology thrusts, technology spinoff implications, and laboratory interfaces. These plans must be widely disseminated among the acquisition, logistics, and contractor communities in order to foster technology transition. Their purpose is to ensure user needs are adequately addressed and that the R&M implications of emerging technologies are fully considered.

As demands for R&M expertise grow, career development programs will become necessary to attract and retain the necessary technical personnel. Although a new Air Force Specialty Code for R&M does not appear to be warranted, career management is needed in order to identify and align talent with critical positions. Civilian intern programs have been very successful for the Army and Navy. Intern programs and career broadening opportunities between Air Force Systems Command and Air Force Logistics Command could offer many benefits to the Air Force. As part of this overall effort, major commands in concert with Air University should arrange for R&M orientation and training short courses for appropriate executives, program managers, system managers, staff officers, and engineers. This is essential to broaden the understanding and support for R&M and ensure an isolated "ility" syndrome is avoided.

These actions are designed to ensure sound organizational support and advocacy for R&M. Together they will provide the R&M managerial and technical excellence necessary to carry out the major new thrusts of the Air Force R&M improvement program.

C. OBJECTIVE III: Improve R&M Planning. Once direction has been established and the organizational structure to manage it put in place, the next step is to develop a roadmap to achieve the specified R&M improvements. The lack of effective planning was one of the major shortcomings noted in the total R&M program. For example, it was known that the design process must begin with the user as an active participant. It must continue in an iterative manner throughout the acquisition process and achieve the majority of design growth prior to entering production. However, emphasis on cost, schedule, and performance had resulted in diminished R&M characteristics for some fielded systems. In these cases, the logistics system was required to adapt to fielded R&M characteristics with inventory and manpower adjustments. The weapon system modification process must consider these unsatisfied R&M requirements. Hence, there must be a comprehensive planning process in order for fielded systems to achieve the desired levels of R&M. Improved R&M planning in commands, weapon systems, technologies, modifications, and budgets is needed to provide a roadmap to ensure R&M characteristics meet combat effectiveness and operational support goals. The actions required to support this objective are shown in Figure IV-4 and discussed below.

Command-level plans that address the institutionalization process within the command and discuss R&M goals, key initiatives, budgets, and problem areas are the foundation of the planning process. Command-level planning should provide focus on R&M characteristics of weapon systems linked to their combat roles and encourage a healthy and meaningful dialogue among operating, developing, and supporting commands.

Some weapon system R&M planning was being accomplished by Air Force Systems Command and Air Force Logistics Command. This will be expanded to provide for each weapon system a description of R&M requirements related to the operational support goals and the major R&M tasks and



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C.

SEP 17 1984

MEMORANDUM FOR ALL MAJOR COMMANDS-SEPARATE OPERATING
AGENCIES/CC

SUBJECT: Reliability and Maintainability of Air Force Weapon Systems - ACTION
MEMORANDUM

For too long, the reliability and maintainability of our weapon systems have been secondary considerations in the acquisition process. It is time to change this practice and make reliability and maintainability primary considerations.

Reliable weapon systems reduce life-cycle costs, require fewer spares and less manpower, and result in higher sortie rates. Similarly, maintainable weapons require fewer people and lower skill levels, and reduce maintenance times. Equally important, good reliability and maintainability improve the mobility of our forces—fewer people and less support equipment to deploy. They reduce dependence on airlift and prepositioning, while increasing our ability to generate sorties.

We must emphasize reliability and maintainability throughout the acquisition process--from requirements definition, through concept development, design, production, and acceptance. Everyone must insure reliability and maintainability requirements are met through every step of the process. Reliability and maintainability must be coequal with cost, schedule, and performance as we bring a system into the Air Force inventory.

Our efforts, however, should not be confined to new or future programs. Many current systems will be with us into the next century. We need to make modifications which provide proven increases in reliability and address specific problems of maintainability.

To institutionalize the Air Force commitment, Lt Gen Bob Russ and Lt Gen Leo Marquez are forming a working group of logisticians, operators, and acquisition specialists to develop an Air Force-wide action plan with specific recommendations and suspenses. This will be reported to us in early December.

In the meantime, insure your people pay the utmost attention to reliability and maintainability needs as they prepare requirements, review specifications, and devise strategies. We need our best effort across the Air Force on this issue.

CHARLES A. GABRIEL, General, USAF
Chief of Staff

VERNE ORR
Secretary of the Air Force

APPENDIX 2

USAF RELIABILITY AND MAINTAINABILITY ACTION PLAN
R&M 2000



**RELIABILITY AND MAINTAINABILITY
ACTION PLAN**

R&M 2000

APPROVED 1 FEBRUARY 1985



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C.

1 FEB 1985

MEMORANDUM FOR ALL MAJOR COMMANDS-SEPARATE OPERATING AGENCIES/CC

SUBJECT: Reliability and Maintainability of Air Force Weapon Systems - ACTION MEMORANDUM

In our September 17, 1984 policy memorandum on this subject, we emphasized the need to increase Air Force operational effectiveness through improved Reliability and Maintainability (R&M). An effective R&M program can make our weapon systems more available, mobile, and durable, as well as reduce manpower and support costs.

To achieve these objectives, R&M must be considered coequal with cost, schedule, and performance when we develop and modify weapon systems. This R&M 2000 action plan will guide the program to institutionalize R&M throughout the Air Force.

We have established a Special Assistant for Reliability and Maintainability on the Air Staff to serve as the focal point for R&M (AF/LE-R). The Special Assistant will integrate the efforts of the Research and Development and Logistics communities and oversee the execution of R&M 2000. Please give him your full support.

The Air Force must be committed to the R&M 2000 plan. By working together we can ensure air power will be ready and able wherever and whenever it is needed.

CHARLES A. GABRIEL, General, USAF
Chief of Staff

VERNE ORR
Secretary of the Air Force

EXECUTIVE SUMMARY

Reliability and Maintainability (R&M) are critical elements of effective weapon systems. The Air Force has rapidly developed and applied new technology and as a result pushed the performance of our systems to new plateaus of capability. However, operational effectiveness also depends on our ability to successfully support these complex systems in ever more hostile environments. This intensified threat has put a higher premium on R&M. For this reason, the Air Force is committed to accelerating the improvement of R&M across our weapon systems.

At the direction of the Secretary of the Air Force and the Chief of Staff, this action plan, R&M 2000, was prepared to institutionalize that commitment to improved R&M. The plan was prepared by a team drawn from across the Air Force under the direct guidance of a General Officer Steering Group. The action plan is aimed at ensuring R&M is considered across all of our weapon systems and treated equally with cost, schedule, and performance.

Until now, our emphasis on R&M has been focused primarily on cost efficiency considerations. Today, however, operational necessities and logistic support considerations such as mobility, vulnerability, and manpower limitations demand we rethink this focus and work for more rapid improvements in our weapon system R&M. To be successful, this requires a fundamental change in the way the Air Force approaches, considers, and manages R&M.

To bring about this cultural change within the Air Force, R&M 2000 concentrates on six key management objectives. These objectives are aimed at supporting the senior level commitment to R&M, convincing the Air Force and industry of the necessity of this commitment, and focusing our manpower and program resources on institutionalizing this commitment. The major objectives in R&M 2000 are:

- I. Establish clear direction for R&M improvement through visible goals and policy to increase combat effectiveness and operational supportability.
- II. Establish an organizational infrastructure to implement the essential elements of the R&M improvement program, to form a base of technical expertise, and to build advocacy, authority, and accountability into the R&M program.
- III. Establish an R&M planning system to consolidate R&M efforts, tie R&M to operational goals, and ensure coordination across commands, systems, and technologies.
- IV. Establish a system to ensure accountability, review, and feedback on the direction and progress of the R&M program.
- V. Establish a communication and motivation program to sustain the commitment to and organizational support for the R&M improvement effort.
- VI. Establish industry commitment to R&M to ensure contractors have the motivation and capability to support Air Force R&M requirements.

These objectives are based on the knowledge that we can accelerate improvement in R&M once our people are committed to the task and the environment is supportive of these actions. The user, developer, and supporter must work closely to achieve these objectives. All our weapon systems, new and old, are involved. All commands must ensure they have the commitment to improve R&M, the organizational focus to support it, the detailed planning to get there, and the effective tools and techniques in place to make it happen.

The user must concentrate on current and future R&M needs. He must translate his needs for the future combat environment into technically feasible and supportable requirements. But he also must ensure that he is taking advantage of the full R&M potential of the equipment in the field and is effectively feeding back essential R&M information from the flight line to our research facilities, design shops, production plants, and repair depots.

The developer must ensure R&M technology advances along with performance technology, relate those advances to the users' needs, ensure it enters the design, and maintain it during manufacturing. He must ensure the new systems reach the field with the optimum combination of performance and R&M characteristics.

The supporter must ensure our fielded systems are closely tracked in order to be able to quickly upgrade their effectiveness as problems arise or technology offers new opportunities. He must ensure the establishment of a support infrastructure that is responsive and fosters enhanced R&M from the flight line to the depot.

This plan will require the commitment of all Air Force commanders. It will affect all of our weapon systems, involve our best people, cut across all our functions, and capture the support of our contractors. We are fully committed to the success of this plan and look forward to your mutual support as we jointly institutionalize improved reliability and maintainability throughout the Air Force.

Leo Marquez
Lieutenant General, USAF
DCS/Logistics and
Engineering

David L. Nichols
DAVID L. NICHOLS
Lieutenant General, USAF
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DCS/Research, Development
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APPROVED BY:

LARRY D. WELCH, General, USAF
Vice Chief of Staff

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USAF R&M ACTION PLAN - R&M 2000

OBJECTIVE I: ESTABLISH CLEAR DIRECTION FOR R&M IMPROVEMENT THROUGH VISIBLE GOALS AND POLICY TO INCREASE COMBAT EFFECTIVENESS AND OPERATIONAL SUPPORTABILITY

Purpose:

It is essential that top Air Force leadership delineate the operational support demands facing the Air Force and that operating commands and weapon system managers direct their planning and resources to achievement of these objectives. Air Force 2000 clearly states that our forces must operate in a mode that emphasizes survivability, mobility, and flexibility. Improved R&M can provide the leverage to ensure our forces meet Air Force 2000 goals. Toward that end, it is essential the Air Force develop the link between R&M improvement and operational support goals. The following actions establish that link through creation of basic corporate operational support goals, weapon system R&M objectives, management indicators, and a firm doctrinal and policy basis for R&M improvement.

Required Actions:

A. Implement a weapon system R&M objective program that directly relates R&M improvement to the following operational support goals:

- Improving readiness by increasing availability
- Increasing dependability by improving mission completion success
- Lowering manpower requirements by decreasing total maintenance manpower
- Decreasing costs
- Improving mobility

B. Track, project, and report semiannually the R&M impact on the operational support goals by command and major weapon systems to ensure that R&M improvement can be assessed.

C. Establish R&M management indicators to clearly reflect the impact of R&M improvements on operational support goals.

D. Develop improved R&M parameters (measurable, verifiable, and enforceable) that can be translated directly to established Air Force operational support goals.

E. Revise Basic Aerospace Doctrine to include R&M as a fundamental building block of operational supportability to ensure the commitment to R&M is institutionalized at the basic level.

SUSPENSE: Nov 85

F. Revise policy and procedures to encompass the new emphasis on R&M improvement to ensure consistent direction is provided to all functional organizations who must support the R&M goals.

(OPR: AF/LE-R, MAJCOMs OCR: AF/LE/RD/X0)

SUSPENSE: Jul 86

USAF R&M ACTION PLAN - R&M 2000

OBJECTIVE II: ESTABLISH AN ORGANIZATIONAL INFRASTRUCTURE TO IMPLEMENT THE ESSENTIAL ELEMENTS OF THE R&M IMPROVEMENT PROGRAM, TO FORM A BASE OF TECHNICAL EXPERTISE, AND TO BUILD ADVOCACY, AUTHORITY, AND ACCOUNTABILITY INTO THE R&M PROGRAM

Purpose:

Institutionalization of R&M depends on development of organizational support, technical expertise, and advocacy at all Air Force levels. R&M responsibilities are currently widely dispersed among organizations and functions. Clear R&M advocacy and influence are not apparent within the Air Force. Organizational support for R&M, beginning at the Air Staff, is essential if accelerated R&M improvement is to be achieved. These actions are aimed at developing that organizational support throughout the Air Force by establishing Air Staff and MAJCOM R&M organizations to manage the institutionalization process, to promote training and personnel programs to build technical expertise, and to provide the advocacy to sustain the Air Force commitment.

Required Actions:

A. Establish the Office of the Special Assistant to Deputy Chief of Staff/Logistics & Engineering and Deputy Chief of Staff/Research, Development & Acquisition for Reliability and Maintainability on the Air Staff. The Office of the Special Assistant for R&M will have the responsibility, authority, and expertise to become the focus for the R&M improvement program and to ensure the institutionalization of improved R&M. The charter of the organization will include the following:

- Manage and implement the Air Force institutionalization program (R&M 2000)
- Establish operational support goals and track the impact of R&M improvements on goals
- Act as advocate and focal point for Air Force R&M
- Establish and coordinate Air Force policy for R&M
- Develop, coordinate, and implement command, weapon system, and technology R&M planning
- Perform reviews and oversight of program R&M performance
- Provide R&M technical support to the Air Staff Board and Air Force Council including advisability to proceed
- Work with industry to ensure they have commitment and capability to meet Air Force R&M requirements
- Establish an active R&M communication and motivation program
- Monitor institutionalization of R&M improvement at major commands

(OPR: AF/LE/RD/XO

OCR: AF/MP/SA/AC)

SUSPENSE: Feb 85

B. Review organization and infrastructure for adequacy in light of renewed R&M commitment and inform the Air Staff of results and plans to ensure consistent organizational structures exist or evolve to support R&M improvement.
(OPR: MAJCOMs, AFOTEC OCR: AF/LE-R) SUSPENSE: Aug 85

C. Expand and improve R&M educational opportunities by compiling and publishing a compendium of available DOD, Service, civilian, and industrial R&M training; strengthening curricula supporting R&M from basic technical courses through the post-graduate levels; and managing training of R&M technical and managerial personnel to increase their capabilities and level of expertise.

D. Establish career development programs for the R&M discipline to ensure personnel accession, progression, and growth are available to support the demands for technical expertise required by R&M 2000.

E. Prepare and administer R&M orientation and training short courses for appropriate executives, program managers, system program managers, staffs, and engineers to enhance their ability to influence R&M events and programs.

(OPR: AFSC, AFLC) (OCR: AF/LE-R, MAJCOMs) (SUSPENSE: Oct 85)

USAF R&M ACTION PLAN - R&M 2000

OBJECTIVE III: ESTABLISH AN R&M PLANNING SYSTEM TO CONSOLIDATE R&M EFFORTS, TIE R&M TO OPERATIONAL GOALS, AND ENSURE COORDINATION ACROSS COMMANDS, SYSTEMS, AND TECHNOLOGIES

Purpose:

Once an R&M organizational structure has been established and R&M objectives set, a sound strategy must be developed to achieve the goals and guide the organization. To be effective, this strategy must be documented in Air Force planning at the command and weapon system levels, and the R&M effort must be directly related to operational support requirements. The Air Force currently has many R&M organizations and initiatives of varying effectiveness. R&M plans will integrate and coordinate these efforts and increase the payback from our R&M resource expenditures. These actions are aimed at providing a coordinated planning baseline for R&M improvement in commands, weapon systems, technology, modifications, and budgets. These plans will also coordinate R&M efforts across the Air Force and sensitize the Air Force to important aspects of R&M as they relate to operational support capabilities.

Required Actions:

A. Prepare and submit an annual plan describing the command R&M improvement program. Command-level R&M plans will include the operational support goal program, organizational approaches, key initiatives, personnel and training, budgets, R&M issues and problem areas, industry integration (AFSC and AFLC), modification programs (AFLC), and design and manufacturing emphasis (AFSC and AFLC). The plans are aimed at outlining the Commands' current R&M program status, goals, and approaches being taken to institutionalize R&M within the Command and achieve the objectives of R&M 2000.

(OPR: MAJCOMs, AFOTEC OCR: AF/LE-R)

SUSPENSE: Sep 85

B. Prepare and maintain a current R&M plan for each system that shows the impact on operational support goals and includes areas such as a description of R&M tasks being employed, specific requirements, tracking system for R&M parameters, incentives and warranty features, and lessons learned. AFLC and AFSC will coordinate plans with each other and with the using MAJCOMs.

(OPR: AFLC, AFSC OCR: MAJCOMs)

SUSPENSE: Sep 85

C. Prepare and submit an annual R&M technology plan to ensure R&M considerations are included in new technology efforts, successful technology is transitioned to development and operational systems, and user needs are adequately addressed. The plan should cover such areas as key technology thrusts and their contribution to Air Force R&M objectives and goals; potential and planned technology applications to weapon systems; improvements in manufacturing, repair, and logistics processes; laboratory interfaces with users, developers, and supporters; logistics R&D and joint Service initiatives for R&M; and efforts to stimulate, influence, and exploit R&M in contractor independent research and development.

(OPR: AFSC, AFLC OCR: AF/LE-R, MAJCOMs)

SUSPENSE: Sep 85

D. Prepare and submit an annual integrated plan covering weapon system modifications and preferred spares initiatives that outlines their contribution to R&M and operational support goals. The plan will include a priority ranking of improvements (modifications and preferred spares) required on fielded systems, R&M cost-payback analyses, and required funding to accommodate R&M improvements.
(OPR: AFLC OCR: AF/LE, MAJCOMs) SUSPENSE: Sep 85

E. Identify and track budgets that relate to R&M and formulate fiscal R&M programs for the future to develop a sound investment baseline for R&M.
(OPR: AF/LE-R OCR: AF/LE/RD/XO/PR/AC, MAJCOMs) SUSPENSE: Dec 85

USAF R&M ACTION PLAN - R&M 2000

OBJECTIVE IV: ESTABLISH A SYSTEM TO ENSURE ACCOUNTABILITY, REVIEW, AND FEEDBACK ON THE DIRECTION AND PROGRESS OF THE R&M PROGRAM

Purpose:

An effective feedback and review system must be established to ensure the essential operational support goals are met and R&M improvements are achieved. Lack of traceability and accountability for R&M impacts and achievements are significant deficiencies in the current system. The actions outlined here are directed at establishing thorough reviews of weapon system R&M programs, demonstrating the seriousness of the Air Force commitment to R&M improvement, and ensuring R&M is, in fact, receiving treatment equal to cost, schedule, and performance.

Required Actions:

A. Begin thorough R&M weapon system reviews on programs to provide R&M technical support to the Air Staff Board and Air Force Council. Include coverage of areas such as incentives and warranties, contribution to operational support goals, and current tasks and initiatives.

(OPR: AF/LE-R OCR: AF/LE/RD/XO) SUSPENSE: Apr 85

B. Begin independent R&M reviews of selected programs to ensure sound R&M initiatives are being planned and implemented by program managers, system program managers, and contractors on major Air Force weapon systems.

(OPR: AF/LE-R OCR: AFLC, AFSC, AF/AC/LE/RD) SUSPENSE: Feb 86

C. Revise the methodology for establishing R&M operational needs by requiring statement of parameters in a manner directly related to the operational need and capable of translation into measurable, verifiable, and enforceable contract requirements.

(OPR: AF/LE-R OCR: MAJCOMs, AF/RD/XO) SUSPENSE: Dec 85

D. Provide a plan to develop and implement an R&M data collection system to track measurable R&M parameters so that R&M can be evaluated throughout the weapon system life cycle.

(OPR: AF/LE-R OCR: AFLC, AFSC) SUSPENSE: Dec 85

E. Establish a system to identify generic R&M needs, innovations, and technological successes, and transfer this information across applicable weapon systems to guarantee maximum utility and payback are attained from R&M investments and actions.

(OPR: AFLC, AFSC OCR: AF/LE-R) SUSPENSE: Sep 85

F. Review selected weapon system decision documentation including the statement of need, program management directive, decision coordinating paper, request for proposal, source selection plan, acquisition plan, and R&M plan on weapon system programs to ensure R&M is adequately addressed and to assess their impact on operational support.

(OPR: AF/LE-R OCR: AF/LE/RD/XO) SUSPENSE: Apr 85

G. Establish Air Force review of command and weapon system R&M activities through active staff assistance and IG surveillance to assess the degree of compliance with R&M policy and procedures, to assist commands in building effective R&M programs, and to evaluate R&M 2000 implementation effectiveness.
(OPR: AF/LE-R, AF/IG OCR: MAJCOMs)

SUSPENSE: Sep 86

USAF R&M ACTION PLAN - R&M 2000

OBJECTIVE V: ESTABLISH A COMMUNICATION AND MOTIVATION PROGRAM TO SUSTAIN THE COMMITMENT TO AND ORGANIZATIONAL SUPPORT FOR THE R&M IMPROVEMENT EFFORT

Purpose:

Leadership must effectively demonstrate and communicate commitment to R&M improvement throughout the Air Force. Top-level commitment was consistently found to be the most important element of successful R&M programs. An effective communication program will keep this top-level commitment visible to all Air Force people and provide for an exchange of R&M ideas. The motivational initiatives will challenge Air Force people to excel and reward those who succeed. The following actions are directed at communicating the importance of R&M and encouraging Air Force people by highlighting model R&M programs and success stories, publishing motivational material, sponsoring professional symposia, and creating a program to reward R&M achievements.

Required Actions:

A. Identify and promote successful R&M programs from the technology base and from development, production, and fielded systems to serve as models and standards of excellence across the Air Force.

(OPR: AFSC, AFLC OCR: AF/LE-R, SAF/PA) SUSPENSE: Jul 85

B. Develop and implement a coordinated internal information plan to clearly communicate the senior-level commitment to sustain and broaden the Air Force emphasis on R&M.

(OPR: AF/LE-R OCR: AF/AC, SAF/LL/PA) SUSPENSE: Jul 86

C. Identify, publish, and use R&M success stories and lessons learned to sustain an effective communication and motivation program across organizations and weapon systems.

(OPR: MAJCOMs OCR: AF/LE-R, SAF/PA) SUSPENSE: Quarterly

D. Publish motivational tools such as pocket R&M guides or fact sheets on successful R&M programs to provide information and sustain interest in R&M.

(OPR: AFSC, AFLC OCR: AF/LE-R, SAF/PA) SUSPENSE: Dec 85

E. Publish guidebooks for implementing successful R&M programs on new and fielded systems to provide a source of R&M information for program managers, system program managers, engineers, and other R&M functional personnel.

(OPR: AFSC, AFLC OCR: AU, AF/LE-R) SUSPENSE: Jun 86

F. Conduct a symposium for senior Air Force and industry leaders to promote R&M initiatives, exchange R&M ideas, and assess the progress toward institutionalizing the commitment to R&M.

(OPR: AF/LE-R OCR: MAJCOMs) SUSPENSE: Feb 86

G. Expand the scope of the AFSC/AFLC R&M workshop to address R&M from a managerial perspective and include participation by program managers and system program managers to foster increased R&M emphasis and commitment.
(OPR: AFSC, AFLC OCR: AF/LE-R) SUSPENSE: Oct 85

H. Establish an Air Force award program for individual and organizational R&M excellence to recognize R&M achievement and to motivate others to excel.
(OPR: AF/LE-R OCR: MAJCOMs) SUSPENSE: Feb 86

USAF R&M ACTION PLAN - R&M 2000

OBJECTIVE VI: ESTABLISH INDUSTRY COMMITMENT TO R&M TO ENSURE CONTRACTORS HAVE THE MOTIVATION AND CAPABILITY TO SUPPORT AIR FORCE R&M REQUIREMENTS

Purpose:

Industry plays a vital role in the Air Force initiative to improve the R&M of weapon systems. Contractors design, develop, and manufacture weapon systems in response to the requirements and priorities expressed in requests for proposals and contracts. The specification, statement of work, and proposal evaluation factors are clear expressions of the level of Air Force commitment and priority for R&M. Accelerated improvements in R&M can only be attained if these documents clearly communicate and reinforce the R&M commitment. These actions are designed to ensure internal planning, requirements documents, and review efforts demand and support high priority for R&M.

Required Actions:

A. Incorporate R&M considerations into weapon system acquisition planning to ensure business strategy, program direction, and contract preparation effectively address R&M throughout the acquisition process.

(OPR: AFSC, AFLC, AF/RD OCR: AF/LE-R, MAJCOMs) SUSPENSE: Oct 85

B. Improve the translation of operational needs to ensure requests for proposals and contract specifications contain R&M parameters expressed as measurable, verifiable, and enforceable requirements.

(OPR: MAJCOMs OCR: AF/LE-R/XO/RD) SUSPENSE: Nov 85

C. Increase consideration of R&M in all weapon system source selections and include R&M expertise in source selection organizations to ensure the Air Force commitment to R&M is reflected in contract awards.

(OPR: MAJCOMs OCR: AF/LE-R/RD) SUSPENSE: Sep 85

D. Implement in-depth assessment of R&M during all design reviews to provide early evaluation of R&M plans and progress and to ensure R&M is being treated equal to other performance requirements.

(OPR: AFSC, AFLC OCR: AF/LE-R) SUSPENSE: Sep 85

E. Enhance the use of Product Performance Agreements (PPAs) by establishing and implementing an aggressive policy for their use, improving warranty administration, and intensifying management review of PPAs to ensure contractor commitment and motivation.

(OPR: AF/RD OCR: MAJCOMs, AF/LE-R) SUSPENSE: Sep 85

F. Establish a program designed to encourage aerospace contractors to implement R&M motivation programs and to employ effective R&M design and manufacturing techniques to ensure their commitment and capability to meet Air Force requirements.

(OPR: AFSC, AFLC)

OCR: AF/LE-R)

SUSPENSE: Dec 85

USAF R&M ACTION PLAN - R&M 2000

SCHEDULE

OBJECTIVES AND ACTIONS	1985						1986
	F	M	A	M	J	J	
I. DIRECTION & GOALS					*		
A. Establish Wpn Sys R&M Objectives					*		
B. Report R&M Impacts on Spt Goals					*		
C. Establish R&M Mgt Indicators					*		
D. Develop Improved R&M Parameters							> Jan
E. Revise Basic Aerospace Doctrine						*	
F. Revise R&M Policy & Procedures						*	> Jul
II. ORGANIZATION AND TRAINING	---	*					
A. Establish HQ USAF Spec Asst	---	*					
B. MAJCOMs Review R&M Org Structure					*		
C. Expand R&M Ed/Trng Opportunities						*	
D. Establish R&M Career Dev Programs							> Feb
E. Prepare R&M Orientation Courses						*	
III. PLANNING					*		
A. Prepare Command-Level R&M Plans					*		
B. Upgrade Weapon System R&M Plans					*		
C. Prepare R&M Technology Plan					*		
D. Improve R&M Modification Planning					*		
E. Identify, Track R&M Budgets						*	
IV. ACCOUNTABILITY AND FEEDBACK		*					
A. Intensify Wpn Sys R&M Reviews		*					
B. Conduct Independent R&M Reviews							> Feb
C. Improve Statement of R&M Reqs						*	
D. Develop an Improved R&M Data Sys						*	
E. Identify Generic R&M Needs					*		
F. Review Program Documents for R&M		*					
G. Increase R&M Surveillance							> Sep
V. COMMUNICATION AND MOTIVATION					*		
A. Identify, Promote Model Programs					*		
B. Develop Information Plan for R&M							> Jul
C. Publish R&M Success Stories					*		
D. Publish Motivational Tools						*	
E. Publish R&M Guidebooks							> Jun
F. Conduct AF/Industry Symposium							> Feb
G. Expand AFSC/AFLC R&M Workshop						*	
H. Establish AF R&M Award Program							> Feb
VI. INDUSTRY COMMITMENT					*		
A. Incorporate R&M in Acq Planning						*	
B. Improve R&M Reqs in Acq Documents						*	
C. Increase R&M Consid in Source Sel					*		
D. Assess R&M in Design Reviews					*		
E. Enhance Use of Warranties					*		
F. Industry Institutionalization						*	

USAF R&M
ACTION PLAN DEVELOPMENT TEAM
FINAL REPORT

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